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GAS LIGHT JOURNAL

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[OFFICIAL NOTICE.]

Eighth Annual Meeting, Ohio Gas Light Association.

OFFICE OF SECRETARY, February 12, 1892.

The Eighth Annual Meeting of the Ohio Gas Light Association will be held at Columbus, O., on March 16 and 17, 1892.

The following papers are promised:

1. "A Basis for Equitable Rates to all Consumers," by M. A. Gemuender, Columbus, O.

2. "The Prevention of Errors in Reading Meters," by N. F. Nash, Windsor, Ont.

3. "The Relation of Holder Capacity to Output," by G. N. Clapp, Middletown, O.

4. "How to Put a Small Gas Works on a Paying Basis," by C. H. Marden, Coshocton, O.

5. "The Testing of Ammoniacal Liquor," by George Osius, Detroit, Mich.

6. "Should Gas Companies do all Gas Fitting," by W. H. Anson, Columbus, O.

7. "The Determination and Regulation of the Proper Proportions of Primary and Secondary Air and of Steam in Regenerative Furnaces," by Fred. Bredel, Milwaukee, Wis.

8. "The Relation between Increase of Output and Decrease in Cost of Manufacture and Distribution," by Henry Padan, Portsmouth, O.

9. "Gas Burners, and the Gas Company's Interest in Them," by J. A. Faux, Pittsburgh, Pa.

10. "The Present and Future Coal Tar Market," by C. H. Welch, Athens, O.

The Question-Box will be opened as usual.

The Chittenden Hotel will be the headquarters for the members, and the sessions will be held in the Gas Company's employees' hall, at the gas works, one square from the hotel.

A model Stroh & Osius concentrator, of a size adapted to a small works, will be exhibited in operation in the scrubber room at the gas works.

There will be the usual public exhibit of gas stoves, etc.

The Association badges will be ready for distribution, to those ordering them, in the latter part of February.

IRVIN BUTTERWORTH, Sec.

THE NEW ENGLAND MEETING.

SPECIAL EDITORIAL CORRESPONDENCE.—*Boston, Mass., Feb.* 18, 1892. The Twenty-Second Annual Meeting of the New England Association of Gas Engineers was brought to an adjournment this afternoon, and it is my pleasing task to say that its history or records show that the parent of our American Gas Associations rounded out its 22d year of life in a vigorously healthful state. No fitful moods mark its policy and practice, and it flourishes from a regimen the value of which is best estimated in the results that it produced. It was feared that President Allyn would not be able to preside, for it was more or less generally known that the Sage of Cambridge had suffered much from illness this winter, but yesterday (Wednesday, 17th inst.) morning when the cosy meeting room in Landlord Whipple's Hotel was invaded by the members all doubt was dispelled, and anxiety gave way to congratulation. It is true that he was not as robust as of old, but he had conquered disease and was virtually himself. That his quaintly keen mentality is as bright as ever was thoroughly shown in his conduct of the affairs of the meeting, and that it was not dormant in his sickness can best be evidenced by a perusal of his annual message,* of which more at another time. The other convalescents, C. J. R. Humphreys, S. G. Stiness and John P. Harbison, it gives me satisfaction to add, were in the flesh and

* See p. 255.

rugged. The attendance was very large and representative, and the visitors (among whom might be named Dr. Wilkinson, and Messrs. Bush, Beal, Egner and Enfer, of New York, Wm. McDonald, of Albany, N. Y., and Gas Commissioner Barker, whose smiling visage caused one to think that his mind still reverted to the potato extract and corn cob addenda of the Beauharnais gas process, as developed before the Commissioners during the New Bedford hearing of some weeks ago, to say nothing of the President of the American Association, the soldierly Capt. White, and the no less military form of the Secretary of the Society of Gas Lighting, Col. Benson, the irrepressible, bubbling Hayward and the youngster protege of S. S. Townsend, Cooke, of New York—but a halt must be called, or this will be nothing else than a roster) took keen enjoyment at the doings of the session.

With a sage like Allyn in the Chair and a student like Prichard at the Secretary's desk one could well imagine that business would be well directed, and it was. If memory does not deceive me 12 names were added to the roll, and a very fitting chapter in the rearrangement of the membership lists was the elevation to honorary membership, from the active ranks, of those veterans, Colonel Armington and Mr. Cabot, whose knighthood was honestly won by years of long and honorable service. Writing still in this personal strain, but in a vein freighted with the sadness that comes to him who knows that death has stilled a voice that oft in cheerful tone and deep sincerity poured out a hearty greeting—one chair was tenantless. John Andrew's kindly face was missing; but his life and work were not forgotten, and if sorrowful remembrance can be counted as evidence of the worth of those who have gone before, then the measure of John Andrew's merit was great indeed.

The Committee of Arrangements had seen to it that nothing was left unattended that could minister to the comfort of the members and visitors, and the executive stuck to their work so persistently that when the hour for the recess was reached the paper by Mr. Richardson had been read and discussed. Prior to the adjournment, a great deal of routine business was disposed of. The afternoon session developed much interesting matter, prominent among which was the report of the Committee of the New England Association on World's Fair, in respect to what had been done. Mr. Harbison presented the report. It was promptly accepted and the Committee were upheld in their action. This was followed by a statement from Mr. Greenough in respect to what the Gas Industry Council were doing in the World's Fair instance, and from the drift of the discussion one need not be much of a prophet to assert that the Council will receive ample assistance, moral and pecuniary, from the New England gas makers. This disposed of, the annual election was proceeded with, which resulted in the selection of the following executives:

President.—Mr. William A. Wood, Boston, Mass.

First Vice-President.—Mr. C. H. Nettleton, Birmingham, Conn.

Second Vice-President.—Mr. Z. M. Jenks, Woonsocket, R. I.

Secretary and Treasurer.—Mr. C. F. Prichard, Lynn, Mass.

Directors.—Messrs. S. J. Fowler, F. W. Norton, E. C. Learned, John A. Coffin and A. K. Quinn.

A glance at these names will be sufficient to show what the future has in store for the executive management of the Association. Dr. Amory read his paper, and the discussion on it was followed by a communication from the Society of Gas Lighting, presented by Mr. Slater, which asked the co-operation of the New England Association in the matter of an attempt to devise a plan for the securing of a uniform standard in certain gas works castings. The Association committed itself to the policy of the proposition. Mr. Kelly's paper was then read, and the Question-Box was opened and the remaining time of the first day was devoted to a study of its queries. The banquet was enjoyed in the usual New England fashion—hospitality, fraternity, eloquence and wit were its condiments.

Boston, Feb. 18.—The attendance was even better to-day than yesterday, considerably over 100 participating. The remaining papers on the list, by Messrs. Wood, McKay and Jenks, were read, and another welcome contribution to the list, not published in the advance official notices, was a paper by Mr. F. C. Sherman, who wrote on "Regenerator Furnaces." The papers contributed were really of a high order, and go to show the great advance that has been made in the past 10 years among the fraternity as to their lines of thought. The paper by Mr. McKay will show my meaning more clearly than is possible in the limit of the time and space at my command. The question-box finished, and other routine matters having been disposed of, the Association, at the invitation of Dr. Amory, inspected the handsome and complete new stations of the Brookline Gas and Electric Light Company, which are fully described in his paper. The weather was bright and cool, and I wish I could truthfully say that the streets of Boston were clean and dry, but February snows and February thaws are beyond remedy, even in the Athens of America. The meeting and its outcome are well worthy of the New Englanders, who, in Worcester over a score of years ago, outlined a plan of action that has been well tried by the test of time.—***.

It was our purpose with this issue to print an accurate history of the life of the late Mr. John Andrew, of Chelsea, but the publication is postponed to next week on account of unavoidable delay in obtaining certain matter necessary to the sequence of the story.

[Official Report—Revised by the Secretary.]

TWENTY-SECOND ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held at Young's Hotel, Boston, Mass., Feb. 17 and 18, 1892.

First Day—Feb. 17—Morning Session.

The Association was called to order, at 10:30 A.M., February 17th, by the President, Mr. Horace A. Allyn, of Cambridge, Mass.

On motion of Mr. Leach, seconded by Mr. Stiness, the reading of the minutes of the last meeting was dispensed with, the same having been printed in the American Gas Light Journal.

Letters of Regret.

Secretary Prichard read letters from Mr. W. E. Russell, Governor of Massachusetts, and from scores of men prominently identified with the gas interests of the country, regretting their inability to be present at the meeting.

These having been ordered placed on file, Secretary Prichard announced that the Board of Directors had reported favorably on the names of the following

Applicants for Membership.

Active Members.	*Associate Members.*
Bush, R. W., So. Boston, Mass.	Gerdenier, C. M., Bridgep't, Conn.
Campbell, J. F., Eastport, Me.	Greenleaf, C. H., Bath, Me.
Fette, W. E., Boston, Mass.	Hahn, J. W., Boston, Mass.
Hayden, W. H., Bath, Me.	Mace, F. W., Lynn, Mass.
Humphreys, A. C., Fall R'r, Mass.	Twitchell, F. H., Bath, Me.
McCarthy, D. W., Wakefield, Mass.	
Willard, A. R., Greenfield, Mass.	

Transfer from Associate to Active Membership.

W. E. McKay, Boston, Mass.

Election of New Members.

On motion of Mr. Nettleton the Secretary was instructed to cast the ballot of the Association for the election to membership of the gentlemen named. The Secretary having reported in accordance with his instructions, the newly elected members were introduced to the Association.

Transferred from Active to Honorary Membership.

The Secretary also reported that the Directors recommended the transfer of Col. Jas. H. Armington and of Mr. G. D. Cabot from the active membership list to the list of honorary membership.

Mr. S. G. Stiness, in moving the adoption of the recommendation (which was seconded by Mr. Harbison), said: I am sure that recommendation will secure the hearty approval of every member of the Association. Colonel Armington was the originator of this Association, and was present on that mournful day at Worcester,* and as he, like Mr. Cabot, too, has retired from active service in the line of our profession, a profession that they both have honored, even as they honor the lives they live, it is peculiarly fitting that the Association should adopt this recommendation of the Directors to place them among our honorary members. I further move that Mr. Joseph R. Thomas be named to cast the ballot of the Association for the purpose named. (Adopted.)

Mr. Thomas, in casting the ballot, said: Fellow-members, it gives me very great pleasure to cast the ballot of the Association in favor of the election to honorary membership of Col. Armington and Mr. Cabot, both of whom have long been my warm and intimate friends.

The President having formally announced the result (amidst a hum of applause), on motion of Mr. Harbison, the Secretary was instructed to notify Col. Armington and Mr. Cabot, by telegraph, of the action taken by the Association.

Report of the Treasurer.

The following report submitted by Treasurer Prichard was, on motion read, received and placed on file:

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* Mr. Stiness refers to the assemblage at Worcester, Mass., December 21, 1870, the occasion of the funeral of Mr. Jas. Barnard Blake, then Mayor of Worcester, and Superintendent of the Worcester Gas Light Company. Mr. Blake's death was the result of injuries received in an explosion of gas in the purifying house of the Worcester Company.

Account C. H. N.—			
1891. Balance		$77 58	
Received dues, 1889		3 00	
" " 1890		15 00	
" " 1891		87 00	
Admission fees, meeting 1891		45 00	
Interest, Derby Savings Bank		12 00	
Dinner tickets sold		162 00	
			$401 58
Expenses paid (C. H. N.)—			
Young's Hotel, annual meeting	$289 93		
D. H. Bacon & Co	82 60		
H. H. McQuillen	6 00		
Hanft Bros	15 00		
Derby Gas Company, acc. C. F. P	2 19		
		395 72	
Balance to C. F. P			$5 86
Received dues, 1890		$3 00	
" " 1891		6 00	
" " 1892		273 00	
			$287 86
Expenses paid (C. F. P.)—			
Young's Hotel		$2 00	
A. J. Hoitt		9 87	
S. G. Stiness' Committee		55 00	
Whitten & Co. (2 bills)		8 25	
C. F. Prichard, salary		200 00	
Balance on hand		12 74	
			$287 86
Permanent fund in Derby Savings Bank			$600 00

We hereby certify we have examined the Treasurer's account and find the same correct. CHARLES H. NETTLETON, SAMUEL J. FOWLER. } Auditing Committee.

ROLL CALL.

Upon a call of the roll the following members were found to be in attendance:

Honorary Members.

Joseph R. Thomas, New York, N.Y. Col. Fred. S. Benson, B'klyn, N.Y. Capt. Wm. H. White, New York, N. Y.

Active Members.

Addicks, W. R., Boston, Mass.
Africa, W. G., Manchester, N. H.
Allyn, H. A., E. Cambridge, Mass.
Amory, Dr. R., Boston, Mass.
Anderson, W., East Boston, Mass.
Atwood, H. A., Plymouth, Mass.
Badger, W., Concord, N. H.
Bill, G. D., Malden, Mass.
Blood, F. C., Ware, Mass.
Boynton, D., Chicopee, Mass.
Coffin, J. A., Gloucester, Mass.
Coggshall, H. F., Fitchburg, Mass.
Cooper, A. F., Exeter, N. H.
Copp, A. M., Boston, Mass.
Coyle, P., Charlestown, Mass.
Crafts, D. W., Northampton, Mass.
Davis, F. R., Athol, Mass.
Dye, N. C., Rutland, Vt.
Fowler, S. J., Springfield, Mass.
Frost, C. T., Rockland, Me.
Gifford, N. W., New Bedford, Mass.
Goodno, G. F., Dedham, Mass.
Greenough, M. S., Boston, Mass.
Harbison, J. P., Hartford, Conn.
Hassett, E. J., Beverly, Mass.
Humphreys, C. J. R., Lawrence, Mass.
Jenks, Z. M., Woonsocket, R. I.
Jennings, F. W., S. Framingham, Mass.
Kelly, H. H., Waltham, Mass.
Lamson, C. D., Worcester, Mass.
Lane, F. H., Wallingford, Conn.
Lane, H. M., Leominster, Mass.
Leach, H. B., Taunton, Mass.
Learned, E. C., New Britain, Conn.
Learned, W. A., Newton, Mass.
Long, R. J., Salem, Mass.
Macmun, G. F., Natick, Mass.
Manchester, G. L., Easthampton, Mass.
Moore, D., Salem, Mass.
Neal, G. B., Charlestown, Mass.
Nettleton, C. H., Birm'gham, Conn.
Norton, A. M., Nashua, N. H.
Norton, F. W., Nashua, N. H.
Norton, H. A., Boston, Mass.
Nutter, E. J., Milford, Mass.
Nutter, J. J., Milford, Mass.
Parker, A. H., Bangor, Me.
Parker, F. H., Burlington, Vt.
Prichard, C. F., Lynn, Mass.
Quinn, A. K., Newport, R. I.
Richardson, F. S., No. Adams, Mass.
Rogers, J. F., Boston, Mass.
Rossman, G. M., Keene, N. H.
Saville, L. A., Lexington, Mass.
Sherman, F. C., New Haven, Conn.
Slater, A. B., Providence, R. I.
Slater, A. B., Jr., Providence, R. I.
Snow, W. H., Holyoke, Mass.
Spaulding, C. F., Waltham, Mass.
Spaulding, C. S., Brookline, Mass.
Stiness, S. G., Pawtucket, R. I.
Stratton, W. K., Haverhill, Mass.
Tarbell, A. W., Waltham, Mass.
Thayer, W. F., Westfield, Mass.
Tilton, D. D., Newburyport, Mass.
Todd, J. R., Middletown, N. Y.
Wetherbee, G. E., Worcester, Mass.
Wood, W. A., Dorchester, Mass.

Associate Members.

Coburn, C. M., Chelsea, Mass.
Davis, F. J., Waltham, Mass.
Hicks, G. C., So. Boston, Mass.
Holmes, R. E., W. Winsted, Conn.
Homes, W., Boston, Mass.
McKay, W. E., Boston, Mass.
Sprague, P. W., Boston, Mass.
Thomas, F. W., Boston, Mass.
Waldo, C. S., Boston, Mass.
Willard, C. E., Boston, Mass.
Woodman, E. H., Concord, N. H.

President Allyn then read the annual address:

PRESIDENT'S ADDRESS.

Gentlemen of the New England Association: It gives me great pleasure to wish you all a "Happy New Year," and to welcome you to this, our twenty-second annual meeting. Another year has been added to the history of our Association and to that of the great industry in which we are engaged, and now that the year, with its cares and trials, its failures and successes, has ended, it is indeed a pleasure to once more gather together here, to give old friends a cordial shake of the hand, to compare experiences, and to aid each other in solving the difficult problems which we occasionally meet in the performance of our duties.

Death of Mr. John Andrew.—In conversation with our Secretary a few days ago, in reference to our coming meeting, we were congratulating ourselves that I should have the pleasure of announcing that during the year no death had occurred in the membership of this Association. How little did we dream that we should so soon be called upon to bid a final adieu to our old friend John Andrew. Death at all times is an unwelcome guest, but in this instance we had no warning of his approach, and it is indeed hard to realize that honest, warm-hearted John Andrew, who since the formation of this Association has, at each successive meeting, met us with his cordial welcome and warm grasp of the hand, will meet us here no more. Truly, the Reaper came "like a thief in the night."

To most of us I believe the year just passed has been an unusually busy one. From all directions I hear most encouraging reports of increased output of gas, which, in a majority of cases, calls for alterations or extensions of the producing plant, and increased cares and responsibilities for the engineer in charge.

Municipal Control.—Perhaps the most important event that has occurred in connection with the gas industry of New England during the past year has been the passage by the Massachusetts Legislature of a measure entitled "A Bill to Enable Municipalities in Massachusetts to Distribute Gas and Electricity." The measure was undoubtedly engineered through the Legislature by the Nationalists, who have repeatedly asserted that it was only a question of a few years before every gas company in the State would be under municipal control.

This bill (it is quite a lengthy document) in brief provides that any city or town may construct, purchase, lease or establish and maintain one or more plants for the manufacture and distribution of gas or electricity.

Section second provides that before the city or town can exercise the authority conferred by the bill it must receive a two-thirds vote of the city or town government for two consecutive years, and be ratified by a majority of the voters at an annual election. When such a vote fails of passage, it cannot again be submitted for five years. If a gas or electric plant is in operation where a city or town desires to take advantage of this bill, the municipal authority must purchase the same. If the parties cannot agree as to the value of the plants, application may be made to the Supreme Court for the appointment of a Commissioner who shall file his award to said Court. If either party is dissatisfied with the decision of the Commissioner, an appeal may be made to the Court, whose verdict shall be final.

The bill as first submitted was radically different in tone from the above, but it was amended so that the rights of the companies now seem to be well guarded.

In this connection, I would call the attention of the members to a paper in the AMERICAN GAS LIGHT JOURNAL,* of Jan. 25th and February 1st, read before the American Economic Association, by E. W. Bemis, Ph.D. on this much talked of subject of "Municipal Control." While you will probably not agree with all of his conclusions, yet the paper I think will well repay a careful perusal.

Improved Furnaces.—On the subject of regenerative furnaces but little can be added to what has been already brought to your notice at former meetings. I have understood that some of our members have been experimenting with half-depth furnaces, with a view to employing a more simple form of setting, and at the same time obtain equally desirable results. It is to be hoped that the Association may have the benefit of their experience. Mr. Snow, of Holyoke, has recently patented an improved furnace, of which a full description appeared in the AMERICAN GAS LIGHT JOURNAL,† of Dec. 14th. Mr. Snow will, undoubtedly, give us the results he has obtained in the use of his furnace.

The Brin Process.—A company has been organized at Philadelphia for the introduction of the so-called "Oxy-Hydrogen Process." They propose to install their apparatus as an auxiliary to gas works, for the purpose of enriching coal gas. This they agree to accomplish to any extent required, at an expense not to exceed 1¾ cents per candle per thousand feet of gas enriched. I have no data as to cost of plant.

Residuals.—In the sale of residuals the companies have had just cause for satisfaction. The price of tar has advanced to a figure unheard of in recent years. In many localities the demand for coke at advanced prices has steadily increased on account of reduced production

* *Ante*, pp. 113-148. † Vol. LV., No. 24, p. 848.

by the works in the neighboring cities where water gas has been largely manufactured.

While we may well be pleased at this condition of affairs, allow me to counsel my friends who have been boasting of the prices at which they have sold tar during the past year, to remember the story of the golden egg. Charge your customers a fair price and you will doubtless retain their trade. They may pay you an exorbitant price for a while as a matter of convenience to themselves, but sooner or later they will seek other sources of supply.

The price now paid for ammoniacal liquor will well warrant the introduction of concentrators into many small works where this residual has heretofore been a waste product.

Electric Competition.—It is now a somewhat difficult task for your President to discuss the question of electric competition. It is only a few years since the members of this Association were a unit in opposition to the introduction of electric lighting under any circumstances. Now all this is changed.

To speak in a general way, judging from the constant additions that are being made to the electric plants all about us, the traffic, so far as increase in service is concerned, must be in a flourishing condition. It seems to me the lesson that this condition of affairs teaches those of us who have not and who do not intend to become identified with the electric lighting, is, that determined, persistent effort is required if we are to hold our own against the attacks of our competitors. And I would suggest that in many companies the work might be profitably begun by awakening the Board of Directors to the true state of affairs. Many of these gentlemen are conservative, easy-going men. They receive their 8 or 10 per cent. dividends, and think it is best to let well enough alone. If a suggestion is offered that the sales of gas may be materially increased by the introduction of stoves, they can see no reason why the company should leave the "straight and narrow way" that it has trod for so many years, to engage in the gas stove business. Try, gentlemen, and instill a little of the push and energy into your directors that characterize the managers of the electric companies. There is a broad field open in every city and town for the introduction of stoves, if the proper means are adopted to bring them to the notice of your consumers. Urge upon your directors the propriety of reducing the price of gas to as low a figure as a safe management of the business will allow. It is difficult to convince some that lower prices will be followed by increased sales, though I believe such has been the almost universal result. No mercantile establishment is now considered fully equipped unless provided with a trained corps of traveling salesmen, whose duty it is to keep their special line of goods constantly before the public, and in season and out of season to urge the purchase of the same. Now, why should not gas companies employ "drummers," who should not only urge the use of gas to those who are not already consumers, but should also call the attention of consumers to the advantage of leasing or purchasing some form of gas stove. Also, to advise them in the selection of suitable burners, and supply them when desired. This is precisely what our electric friends are doing every day. Are we too modest, or do we lack the energy to adopt the same tactics?

Combination of Gas and Electric Interests.—On the subject of the combination of the gas and electric interests, I have seen no reason to change the opinion that I have always entertained, that in a majority of cases no benefit will accrue to the gas company by such coalition. As far as financial results are concerned, the endeavor to compare results by reading the annual statements of the different companies, reminds one of an effort to solve a Chinese puzzle. No two companies seem to follow the same methods in making their reports. On one point most of the returns seems to agree, viz., that the net earnings on the electric plant have been about 6 per cent. How has this result been obtained? Nothing, I think, has been charged off for depreciation, in a business where the wear and tear must be excessive. Of the necessity for a reserve fund, the two serious accidents in extensive plants in this vicinity during the past year would seem to leave no doubt.

Of the propriety or expedience of the superintendent of the gas works assuming control of the electrical branch of the business, I have grave doubts. I fear in many cases it will be a repetition of the boy with the new toy. The temptation will be to desert the old love for the new. In other words, the novelty of the situation, and his anxiety lest something go wrong, will cause him to unconsciously devote a large part of his care and attention to the new plant, to the neglect and detriment of the old. If it is desirable that the superintendent of the gas company should assume the control of the combined plants, the proper course to pursue would seem to be to promote him to general manager, and then appoint a successor to fill his old position.

Improved Burners.—In the introduction of improved burners, so far as I am aware, but little if any progress has been made. In Cambridge the number of Lungren lamps in use has decreased. Some have been replaced by incandescent lights, and in other cases the consumers have become tired of paying the rental. In the latter cases we have endeavored to dispose of the lamps to the consumers on the best terms we could agree upon.

The Welsbach burner has, I think, proved a disappointment. I notice that in many places where it was formerly in use it has been discarded, and where it is still retained the result is anything but cheerful.

It is to be regretted that with all the inventive genius with which the Yankee nation is endowed no burner has yet been invented capable of producing a high illuminating power, and at the same time combining the qualities of cheapness, simplicity, and durability. The man who succeeds in accomplishing these ends will win fame and fortune.

Water Gas.—I presume that an annual address to this Association would not be considered complete without some allusion to water gas. Very little can be added, however, to what has already been said. I believe it is now generally conceded that coal gas can be manufactured, of a satisfactory quality, at as low a figure as water gas can be produced, the past assertions of our water gas friends to the contrary notwithstanding. When, however, we consider the possibility of the stoppage of a large works by reason of a strike of its employees, or, in fact, a short supply of gas from any unexpected cause, and then realize the limited time required to get a water gas apparatus into full operation without injury to the plant, it is a question if any city company is performing its whole duty to the community in which it is located if it does not add to its coal gas plant a water gas apparatus of sufficient capacity to meet any emergency that may arise. The opinion entertained by those best qualified to judge seems to be that a mixture of, say, two-thirds coal gas and one-third water gas gives the most general satisfaction. In fact, this combination seems to meet all the requirements of the case.

The water gas may be made of sufficiently high candle power to serve as an enricher to the coal gas, producing a whiter and more brilliant light, while the latter keeps the specific gravity within reasonable bounds, permitting the combined gases to be freely distributed through the smaller street mains, when it would be impossible to accomplish the same end with water gas alone in a satisfactory manner.

Coal Supply.—The short supply of coal during the year 1890, owing to extensive strikes in the mining regions, which occasioned so much inconvenience, and in many cases serious loss to the gas companies in this vicinity, was happily not repeated the past year, as the market was abundantly supplied.

Bitter complaints have, however, been heard in various quarters of the quality of the coal furnished in some instances by the old standard companies, who evidently entertain the idea that the past reputation of their product will ensure the sale of their coals, no matter what the quality may be.

As I sat at this table at our last meeting my eyes wandered over the faces before me, and I was struck by the change that had taken place in the personnel of our Association during the past few years. I looked in vain for a score of familiar forms who were always with us at our annual gatherings, and without whose presence a meeting of the New England Association was considered incomplete. They have drifted from us, some to their final abode, others have relinquished the cares of active business to enjoy a much needed rest in their declining years in the quietude of private life. In place of these old friends who have left us, we see here to-day a gathering of young men whose earnest faces, and the interest manifested in everything pertaining to our vocation, coupled with the great advantages which they have derived from having already acquired a theoretical knowledge of the science of gas manufacture, are assurances that they will succeed in the calling which they have chosen.

Perhaps, young gentlemen, you will pardon me if, after an apprenticeship of 25 years, I venture to offer you a few words of advice. Many of us, especially in our youth, when, as the boys say, "we knew it all," are apt to say and do many things which in more sober moments we deeply regret. Therefore, at all times try and control your tempers. "Think twice before you speak once." Try and cultivate a cordial, friendly feeling with your city or town officials, more especially with the heads of your street, water and sewer departments. You will be constantly brought in contact with these officers, and it rests with you whether it shall be peace or war. You will find the former will prove most beneficial to your company, and conduce to your own peace of mind.

It is even more important that you retain the goodwill and confidence of your consumers. If one of them comes to you charged to the brim with wrath at what he considers an exorbitant bill, allow him time to exhaust his venom, then reply to him in a pleasant tone. Don't assert that you know the bill is correct; you don't know anything of the kind; we are all liable to error. Assure him that you will at once make a personal investigation. I have in mind a case where a consumer demurred at a bill which was $40 in excess of any that he had previously had. An examination of the books at the office, again reading the meter, and an inspection of the same failed to solve the mystery. The matter was then referred to me with the result that I discovered that a rascally agent had applied a "gas saver," which failed to work, and at the same time had removed the check burners in use, substituting them with the simple brass tip. By giving this matter my personal attention, instead of depending on my subordinates, I retained a large consumer, who, by the way, was a director of the electric company.

Avoid the use of profane or abusive language in addressing your subordinates. If you have a man in your employ who fails to perform his duties to your satisfaction, discharge him. But don't lower your standing in the estimation of your employees by using improper language. You will find in the end that it pays to retain their goodwill. When you meet your men on the street don't consider it beneath your dignity to give them the "good morning" or "good evening." It costs you nothing and makes the men feel that they are men like yourselves.

Gentlemen, I have trespassed too long on your valuable time. In conclusion I have only to urge your punctual attendance at our meetings, not only for the benefit you may derive, but in a measure, also, by your presence to repay those who have kindly prepared papers.

I thank you, gentlemen, for your kind attention.

On motion of Mr. Lamson, the address was referred to a committee of three (Messrs. C. D. Lamson, C. H. Nettleton and H. B. Leach), to consider and report upon the suggestions and recommendations contained therein.

(To be continued.)

[Concluded from Page 225.]

Pressure Gauges for High Pressure Gases.

[A paper read by Mr. F. Budenberg, before the Lantern Society.]

Having, then, become acquainted with the construction and working of these gauges, we will next consider the dangers connected with the use of these instruments for high pressure oxygen and hydrogen, or coal gas cylinders, and at the outset we must distinguish clearly between explosions which are the result of bursting of the tube, and chemical explosions, which are due to the firing of inflammable matter in the tube or connections of the gauge. By far the largest number of accidents which have hitherto occurred are the result of chemical action; but some of them must undoubtedly be attributed to a simple bursting of the tube, due either to bad construction or to a defect in the material of the tube. In some cases the tubes have been turned out round, or have been insufficiently flattened, and, in order to obtain sufficient sensitiveness, makers have reduced the thickness of the tube to such an extent, that it has sooner or later burst from sheer weakness. In such instances, the sudden rush of gas, under the enormous pressure into the gauge body, instantly puts the case under a pressure which it is not calculated to stand, and a violent explosion is the result, in which the case is generally shattered whilst the interior of the gauge may be left fairly intact. An accident of this nature is not likely to occur with a well made gauge; but, as even the best tubes may in the course of years develop defects which could by no possibility have been discovered in manufacture, it is, nevertheless, advisable to provide every gauge with a protection against accidents of this nature. For this purpose the best safeguard consists in fitting the gauge case with openings, or other free vent, combined with a check in the inlet to the gauge. The latter will prevent the sudden admission of pressure to the gauge, and any pressure which might otherwise slowly accumulate in the gauge case will be relieved by the vents in the case.

In all gauges manufactured by my firm during the last year, or thereabouts, the vent has taken the form of a loose hinged back or valve, which is held closed by means of a light spring. If even a very light pressure is admitted to the case, this valve will be forced open, and the pressure is then instantly relieved. The entire efficiency of this safeguard has been experimentally demonstrated.

The investigation of the second and more important class of accidents, which are attributable to chemical explosion, is not quite so simple, but the general causes are well understood. They are produced by the ignition of oil or other inflammable matter in the tube, the heat necessary to effect the ignition being the result of the sudden compression of the air or other gas in the gauge tube and connections. When the valve of a cylinder charged to 120 atmospheres is suddenly opened, the whole of the contents of the connections to the regulator and gauge are instantly compressed to the 120th part of their former volume into the most distant parts of the internal passages, such as the extreme end of the gauge tube; setting aside the effect which the mixing of the gases will have, the action is similar to what would occur if the contents were compressed by a piston. In this way sufficient heat is set free to raise the temperature of the compressed body of air or other contents to a considerable degree; and this will suffice to ignite any highly inflammable matter that may have lodged in the extreme end of the tube or connection.

This may be easily and safely demonstrated by a simple experiment. A straight tube, say, 6 inches or 7 inches in length—one end of which is closed by means of a cap, into which a piece of tinder or other similarly inflammable matter is secured—is attached to a cylinder containing air compressed to, say, 120 atmospheres. By suddenly opening the valve, sufficient heat will be set free to ignite the tinder. (Experiment shown.) I have even successfully performed this experiment with a tube only 4½ inches long, and with a pressure of barely 80 atmospheres. Mr. Whitefield (Vice-President of the Manchester Photographic Society) has kindly conducted an experiment for me, with the object of determining the temperature of ignition of the tinder used in this experiment; and he finds that this is about 412° F., which, I think, is about the same as the firing temperature of an explosive mixture of hydrogen and oxygen. If such ignition can be produced in the presence of air only, how much more likely may this not be in an atmosphere of oxygen! Let us now suppose that traces of oil have been left in the gauge by the maker, or that oil which has been used for lubricating the valve of the cylinder, or other purpose, has been blown into the gauge tube during an admission of gas. If such a gauge is applied in an oxygen cylinder immediately after use on a hydrogen cylinder, and the valve is opened suddenly, the heat set free will be sufficient to fire the mixture of oxygen and hydrogen in the end of the tube, and this, in turn, will ignite the oil in the tube, with the result that a violent explosion will occur, owing to the rapidity and intensity with which the oil is consumed in the presence of oxygen; but even without having hydrogen present, the heat evolved by a sudden opening of the valve may be sufficient to ignite directly any oil that has gained access to the tube. Possibly some of the oil might be carried forward by the in-rushing gas in the form of spray; and in an atmosphere of oxygen this would probably ignite at a comparatively low temperature. The temperature of any oil in the tube may even be materially increased by friction resulting from the in-rushing gas; or the particles of oil, carried forward with great violence, might become heated by friction against the sides of the tube and by the sudden impact with the end of the passage; and all these circumstances would increase the danger of explosion.

Since the danger of the presence of oil in these gauge tubes has come to be realized, we have discontinued the practice of using oil for dividing and testing these gauges, pumps filled with water having been adopted instead; and the greatest care is exercised to prevent any oil from coming into contact with the gauge fittings during manufacture. Special water pumps are now set aside purposely for this work, and the connections are so arranged that it is impossible for any workman to screw the gauges on to an oil pump without providing himself with a special connection for this purpose—all chances of a mistake being thus overcome. The pumps themselves are fed from the town's main, and, after each test, the contents of the pumps are discharged into a white enameled trough, in which any traces of oil can easily be detected. Subsequently, the contents of the tube are extracted by means of a vacuum pump, and are examined for oil. Finally, the remnants are blown out by admitting air pressure to the gauge at 100 or 120 atmospheres, and suddenly releasing this pressure. In this manner, every thing that human foresight can provide is done to minimize the chances of the tube containing, when completed, even the slightest traces of oil. But, in spite of every care, the entire absence of oil or other inflammable matter cannot be absolutely assured; and even if this were done, there always remains the danger of oil gaining access to the tube accidentally when a gauge is in use. Therefore, whilst continuing to exercise every care to keep away all traces of oil, the ultimate safeguard against accidents of this description must be looked for in another direction, namely, by checking the sudden inrush of gas to the gauge when opening the valve, so that the pressure in the gauge rises gradually, and the heat evolved has time to be absorbed by the material of the gauge tube. This may be accomplished by opening the valve very gently; but, as this gentleness cannot always be insured, owing to the frequent stiff-

ness of the valves, carelessness, and want of skill, it is indispensable, in order to secure perfect safety, to fit each gauge with some means for automatically checking the admission ; and, whatever check is employed for this purpose, it must not require any particular attention or manipulation. Various devices have been brought out for this purpose ; but, of all that have come within the limit of my experience, the check patented by Mr. W. M. Jackson, of the Manchester Oxygen Company, is by far the simplest and best. This consists in screwing a plug, through the center of which a fine hole has been drilled, into the foot of the connecting shank of the gauge. Upon this plug are placed a number of alternate layers of copper wire gauze and felt cloth, in the manner shown in the illustration, Fig. 1. Another screwed plug, similarly drilled with a fine hole, is then added, and the alternate layers of gauze and felt are compressed between the plugs. This packing retards the pressure of the gas, even when suddenly turned on ; but it does not prevent the ultimate admission of full pressure to the gauge.

I am of opinion that absolute immunity from danger of chemical explosions in gauges can be insured by the proper use of this check, and it is not too much to say that no gauge used for this purpose should be without it, or some equivalent device, which has proved satisfactory. If a pressure gauge is of sound construction and well made and fitted with the adjuncts which I have described, and these are kept in proper working order, it may, I think, be accepted that such an instrument is absolutely safe, and there need be no fear of any accident from known causes. The experiment which I have performed before you suggests, however, that even without the use of a pressure gauge an explosion in the connections is possible, provided the end of the passages in the connection is sealed and the pressure suddenly admitted. Generally speaking, the regulator valve is full open when the cylinder valve is being opened, and there is, then, little danger of heating in the regulator connection ; but circumstances might arise in which pressure is suddenly admitted with the regulator valve closed, and here the conditions are precisely similar to those which exist in the cases of gauge chemical explosions. This might, for instance, occur if the valve is opened twice in succession, the first opening having been sufficient to set the regulator to work.

If the pressure is then released and readmitted suddenly, an ignition might occur in the regulator connection. It appears to me that the same thing might happen in using a cylinder valve which is not quite true, and which is worn to an oval shape in the seating. If such a valve is opened, a puff of oxygen sufficient to fill the regulator might be passed, followed by a temporary closing, whereupon a sudden opening might produce in the regulator connection the precise conditions for an explosion. These conditions suggest the theory that some of the explosions which have been attributed to pressure gauges have probably originated in the connection of the regulator itself. The danger under consideration can be minimized by making the connection to the regulator as short as possible ; and, generally speaking, long passages of any kind between the cylinder valve and the regulator or gauge should be rigorously avoided, as constituting a decided source of danger ; and, wherever it is necessary to have a long passage, the end of which is or may become sealed, a check should be provided.

If lanternists would only devote their attention to these points, and assure themselves that the principles here laid down are carefully carried out, we shall have no more explosions ; and my labor in preparing this paper will have been amply rewarded if it should have the effect of arousing the members of this Society, and through their medium other lanternists, to the importance of carefully studying this subject.

A Critical Examination of Modern Practice in Street Lighting with Modern Examples

Mr. W. H. Y. Webber is contributing to our contemporary, the *Journal of Gas Lighting*, a very valuable series of articles on "Lighting," that have attracted and are attracting the attention of gas engineers the world over. Part III. of the series treats of matters noted in the heading, and is as follows :

From what has been already remarked, it follows that if it is impossible, for reasons of economy, to provide much light for a roadway, the smaller the luminous intensity, in reason, of the light sources employed for the purpose, the more equable the effect. Conversely, the more powerful the sources, the higher must be the scale of lighting over the whole roadway. So that, in a sense, it is true that the more powerful the lights, the more of them we need. Again, if it exceeds a certain range of intensity, a lamp for street lighting must be screened from direct view, or it is worse than useless for its intended purpose. Having in mind, therefore, the accommodating power of the human eye for different degrees of illumination, it may be concluded that artificial lights for streets or roadways may well be of very moderate intensity ; and that, this point once defined, multiplication of sources rather than intensification of powers is the simplest way of improvement.

If we take the case of an ordinary suburban road, and consider the problem of lighting it, from the starting point, the first thing to be settled is the minimum luminous power to be allowed for the individual lamps. If it were only a case of what has been called in these articles "beacon" lighting, the smallest flame that can be relied upon to keep alight would serve the purpose, as is actually the case with some railway signal lights. A street lamp is, however, required to do more than merely render itself visible. Wayfarers do not require to read newspapers in any part of the roadway ; but they often need sufficient light for deciphering a written address on a letter or card, for writing a memorandum, for consulting a watch, etc. These wants are really the most exacting that occur to foot passengers in the ordinary way. Those of drivers of vehicles are similar ; and their observations are naturally taken at a height of several feet above the ground level, which favors the light.

Now, observation shows that the requirements just enumerated are satisfied by street lamps exhibiting, at a mean height of 10 feet above the road surface, a gas flame of not less than 12 candle power effective. This means for all qualities of coal gas up to and including gas of 16 candle power, a 5-cubic feet flat flame burner in a well cleaned, neatly-framed lamp. If with thin opal top glasses, so much the better ; but the top of the lantern must in no case be opaque. For richer gas, the rate of consumption may, of course, be smaller ; but the average luminous effect of the lamp should not be lower than 12 candles, after allowance is made for the glass. Such a lamp gives a good, cheerful effect over a radius of at least 50 feet, which may be taken as the area of what appears to the dilated human eye as bright lighting. At this distance, an address on a letter may be read with ease, which means that a passenger need not cross the road for the purpose when he happens to be opposite a lamp. Such lamps throw a distinct shadow on flags or asphalt at a distance of 100 feet ; and if spaced not more than twice this distance, they afford all the light really necessary for purposes of vehicular or foot traffic in suburban roads.

In busier thoroughfares, and especially in streets where there are well lighted shops, the street lamps must be thicker. For it is an almost paradoxical fact that shop light, although it appears to make the pavements brilliant, affords little or no assistance to the street traffic, as shopkeepers who desire to make their windows attractive recognize by adding extra lamps on the curb line. The reason for this is the same that has already been given with reference to intensification of street lamps—it is the presence of higher *maxima* necessitating the elevation of the *minima*. Spots of roadway that would not appear too dark when a single gas lamp supplies the brightest point in the field of vision, look impenetrably obscure by contrast with the glare from a brilliantly lighted window. Good street lighting, for central thoroughfares not specially devoted to shops doing an evening trade, would be afforded by 5-feet lamps at (say) 90 feet apart. When more light than this is required, it is preferable to employ 10-feet burners, beyond which it is not necessary to carry the process of intensification for ordinary thoroughfares, with the exception of street refuge lights. But even these may do more harm than good if too brilliant. Powerful lights demand high columns to bear them.

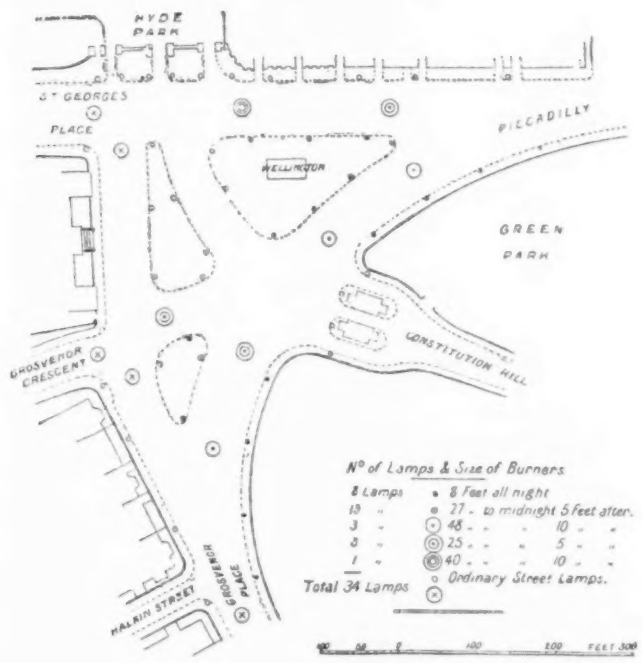
The ordinary 12 candle power street lamp, 10 feet high to the flame, gives on the ground immediately under the lantern an intensity equal to $12 : 1 :: 10^2 : x^2 = 1$ candle at (say) 2 ft. 9½ in. distance. According to the formula already stated, a 24 candle, or a 10 cubic feet flame will give the same intensity of light upon the ground immediately beneath it from a height of 13 ft. 10 in., and so on. Since it is desired to increase the intensity of light on the ground, however, lamp posts are not required to be further heightened in this proportion. It is to be observed, moreover, that street lighting from elevated lamps is, in reality, brighter than is shown by calculations according to the formula given, which shows the value on the ground level, because the solid objects, moving and stationary, perceived by the light, stand up more or less from this level, and therefore tend to neutralize the effect of the Law of the Cosinus. This formula consequently gives only the minimum effect.

This part of the subject may fittingly conclude with one or two descriptions of good examples of street lighting by gas in the best modern style.

The Gaslight and Coke Company have been honorably distinguished for their efforts to raise the standard of gas lighting in the streets of London ; and they have from time to time organized displays of so-

called "experimental" street lighting in different important thoroughfares of the City and West End. There is reason for thinking that these displays, which were in all cases carried out at the Company's own expense, or in concert with the firm of Messrs. W. Sugg and Co., Limited, were effectual in "putting a damper" on the rage for electric lighting upon the extravagant scale on which it was introduced in Paris. Although the "experimental" lighting arrangements were not finally adopted by the highway authorities, quite enough was done in this way to show the baselessness of the contention which the electric light speculators were anxious to establish—that, if better street lighting was wanted, there was no alternative to the arc lamp. This assertion of the electric lighting interest was so effectually met by the high power gas lamps, that to this day electricians never allude to this kind of gas lighting if they can avoid doing so, but always affect to compare arc lamps with 5-feet gas burners.

The exhibition of these specimens of improved street lighting proved, among other things, that the amount of light which could be obtained for any thoroughfare was purely a question of expense; and so the electricians' aitempt to assert a monopoly of brilliant lighting was defeated. At the present time, the pattern display of open air lighting for London is that of Hyde Park Corner, the quality of which will be understood from the accompanying plan, courteously supplied for the purpose of this series of articles by Mr. G. F. L. Foulger, Distributing Engineer of The Gas Light and Coke Company.


HYDE PARK
ST GEORGES PLACE
PICCADILLY
WELLINGTON
GREEN PARK
GROSVENOR CRESCENT
CONSTITUTION HILL
HALKIN STREET
GROSVENOR PLACE
N° of Lamps & Size of Burners
8 Lamps • 8 Feet all night
19 " • 27 " to midnight 5 feet after.
3 " ⊙ 48 " " 10 " "
3 " ◎ 25 " " 5 " "
1 " ◉ 40 " " 10 " "
Total 34 Lamps ○ Ordinary Street Lamps.
⊗
FEET 300

This is luxurious lighting; but the site is one where, of all places in London, street illumination, upon a scale that would elsewhere be regarded as superfluously liberal, is a plain necessity. The rated consumption and the cost of gas are given in the following tabular statement:

Total Estimated Consumption in Lighting the Following Lamps with Cannel Gas (20 Candles Nominal).

Number of Lamps.	Before Midnight. Size of Burner.	Before Midnight. Consumption per Annum. (2,160 Hours Burning.)	After Midnight. Size of Burner.	After Midnight. Consumption per Annum. (1,676 Hours Burning.)	Total Consumption.
		Cubic Feet.		Cubic Feet.	Cubic Feet.
Refuges.... 3	48 ft.	311,040	10 ft.	50,280	361,320
" 1	40	86,400	10	16,760	103,160
" 3	25	162,000	5	25,140	187,140
Footways ..19	27	1,108,080	5	159,220	1,267,300
" .. 8	8	138,240	8	107,264	245,504
Total.....34	.....	1,805,760	.....	358,664	2,164,424
Cost at 2s. 8d. per 1,000 ft..	.....	£240 15s. 4d.	.....	£47 16s. 5d.	£288 11s. 9d.

Average consumption of gas per hour: Before midnight, 836 cubic feet; after midnight, 214 cubic feet.

The irregular shape of the area lighted, and the complexity of the traffic that has to provided for, enhance the brilliancy of the effect, which must be seen to be appreciated. It should be remarked that the lanterns employed here are of special design.

Out of London, the palm for brilliant street lighting would probably be awarded to Belfast. The case of Birmingham is not overlooked in making this statement; but is to be borne in mind that the Birmingham example, like that of Hyde Park Corner, is of a decorative cast, and is concentrated upon a particular area. The Belfast lighting is street lighting pure and simple; and nowhere has the advantage of municipal control of the gas undertaking been more strikingly illustrated in this manner. It is instructive to notice that in Belfast, as elsewhere, it was the electric arc lamp that convinced the Local Authority of the insufficiency of the gas lighting in common use. Mr. James Stelfox, the Engineer and Manager of the Corporation Gas Works, informs the writer that the improvement of the street lighting of Belfast was brought about as follows: Some years ago, certain electric companies began to talk of lighting one of the principal thoroughfares of the city at so much per lamp per hour. It occurred to Mr. Stelfox that this was a very specious way of putting the proposal before the public, who had only the small hourly charge before them, and were therefore induced to ignore the gross yearly charge, to arrive at which required an effort in multiplication. He therefore, through the then Chairman of the Gas Committee (Sir John Savage), obtained permission to light Donegall place, which is about 220 yards long, with gas upon the same basis of charge. It had been computed that six arc lamps would be required for the lighting of this line of thoroughfare, at a cost of 3d. per lamp per hour, or 1s. 6d. per hour for the whole. For the same money, Mr. Stelfox arranged to put in twenty 80-candle gas lamps, with two 200-candle lamps at the end of the place. This was done to show what could be effected at a profit by the Corporation Gas Department for the price asked by the electric light companies. As might be supposed, this special favor to Donegall place created heart-burnings in the citizens whose interest lay in other thoroughfares. Thanks, however, to the public spirit of the Corporation, and the pertinacity of Mr. Stelfox, the improved lighting was in time extended. Owing to the length of the thoroughfares involved in the system, as at present exhibited nightly in this flourishing town, it is impracticable to give a plan of them. It is therefore necessary to rely upon letterpress description. The first line of lighting connects the two principal railway stations, and traces the main artery of traffic. The second branches from the first to the quays.

The first section of the first line commences at the Belfast and Northern Counties Railway Station; and proceeds along York street to Donegall street, being 1,190 yards long, and exhibiting sixty-one 100-candle Bray lamps; the spacing therefore averaging about 40 yards on each side of the street. The lamp columns are 14 ft. 6 in. high; so that the light is shown at a height of about 15 ft. 6 in. above the level of the street. Next comes a section consisting of the first portion of Royal avenue, which has sixteen 80-candle lamps, with four 200-candle lamps at the corners next Donegall street and North street. The lamps average 18½ yards apart on each side of the street. The second section of Royal avenue, from North street to Castle place, contains thirty-one 100-candle lamps at intervals of about 24 yards on each side of the street. In the center of the crossing at Castle place there is a large lamp of 400-candle power for the illumination of the Square. Donegall place, as already remarked, has twenty-one 80-candle lamps, spaced 20 yards apart, with two 200-candle lamps additional at the crossings next the White Linen Hall. All these lamps are on tall posts, showing the light 15 ft. 6 in. from the ground. Two independent main routes from Donegall place to the Great Northern Railway Station are lit with 100-candle lamps on 10 feet posts, at 40 yards intervals. From the central junction at Castle place, and also from the junction of Royal avenue and Donegall street, other lines of lighting extend to the quays and across the river to the County Down and Holywood and Bangor Railway Stations. The direct route from Castle place to the station is 1,250 yards in length, and this is lit by eighty-five 100-candle lamps, with one 200-candle lamp at the junction with Donegall quay; the average spacing of the lamps being thus 30 yards on each side of the thoroughfare. The area in front of the Custom House is lit by seventeen 100-candle lamps on ordinary posts, and two 200-candle lamps. Along the Donegall quay there are sixteen 100-candle lamps on tall columns, 20 yards apart. All this splendid street and quay lighting is continuous. Extending from the points at which the high power lighting ends, the ordinary street lanterns are provided with 8 feet burners for some little distance, so as to diminish the effect of the break; and at many of the ordinary street crossings there are 200-candle lamps, and a few of still higher power.

The lighting upon the higher scale is not kept up after midnight. It should be explained that the use of 80 and 100-candle lamps upon ordinary 10 feet posts is only done to utilize the latter, and avoid the expense of all new lofty posts; but it is acknowledged that the latter are preferable for such high powers in streets. For a specimen of a gas-lit thoroughfare, Belfast can undoubtedly compete with any town in the world.

The lighting of the Brighton Esplanade by high-power "Whitehall" lamps is generally admired. The extent of the sea front at Brighton lighted in this way by gas is 4,000 yards, and reaches from West Brighton to Black Rock. The system comprises 157 "Whitehall" lamps, which burn at the rate of 5 cubic feet per hour for the first half hour of lighting; then they increase to 30 feet, or (say) 100-candle power, until 11 P.M.; after which they are again reduced to 5 cubic feet per hour for the rest of the night. In addition to these, there are 23 lamps burning a maximum of 15 cubic feet per hour. The average height of all the lamp posts is 9 feet.

Some of the comparatively poor parish Vestries of the South of London, who have no "promenades," or "esplanades" to light, but are nevertheless compelled to provide for considerable heavy traffic along the main lines of communication, prefer to use 10 feet burners in "Balham" lanterns, which are ventilated through the top; thus assisting the steady burning of the flame. These lamps are exhibited upon ordinary posts, at distances of 30 to 40 yards. Street crossings are commonly lighted with lamps of 100 or 200-candle power on lofty columns.

Very recently, what is considered to be the best display of electric arc lighting yet seen has been started in Queen Victoria street, City. It ought to be good, for it represents the practical outcome of some seven or eight years' planning, and some highly elaborate financial arrangements. The light is that of ordinary Brush lamps of 12 amperes, credited with 2,000-candle power nominal, which means, perhaps, 1,000-candle power maximum for the naked arc. These are exhibited at about 18 feet above the ground, in polygonal pyramidal lanterns, glazed with waved, etched, or crinkled glass, in order to break up the light without so much loss as is caused by the heavy opal glass in common use. The difficulty in this case is that glass which is sufficiently faceted to break up the rays of the arc also holds much dirt; so that, taking the practical impossibility of thorough cleaning into account, this style of glazing does not gain much upon the opal. The lamp posts are, on an average, 50 yards apart.

From the foregoing examples, the student can draw conclusions as to what is held to constitute good street lighting in the United Kingdom at the present day.

Trewby's Apparatus for Charging Gas Retorts.

On the 9th inst. U. S. Letters Patent (No. 468,374) were granted to Mr. George Careless Trewby, of London, England, for improvements in apparatus for charging gas retorts. Using the words of the specification, the inventor remarks:

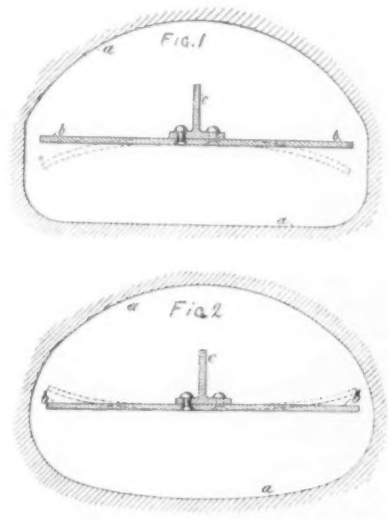
In charging gas retorts with coal there is considerable difficulty in spreading the coal evenly, as required in the retorts, and this difficulty is greatly increased when the retorts are inclined or set obliquely, as is now frequently the case.

The chief object of my invention is to overcome this difficulty, and I attain this object by the use and application of a movable division plate, which, prior to charging, is inserted into the inclined retort and temporarily divides the same into two longitudinal chambers. A hopper, which may or may not be combined with the movable division plate, is employed to guide the coal into the desired portion of the inclined retort, whereby the coal is laid in an even column between the movable plate and the flat side or bottom of the retort. When the inclined retort is charged, the hopper and plate are removed and the end made up in any suitable manner.

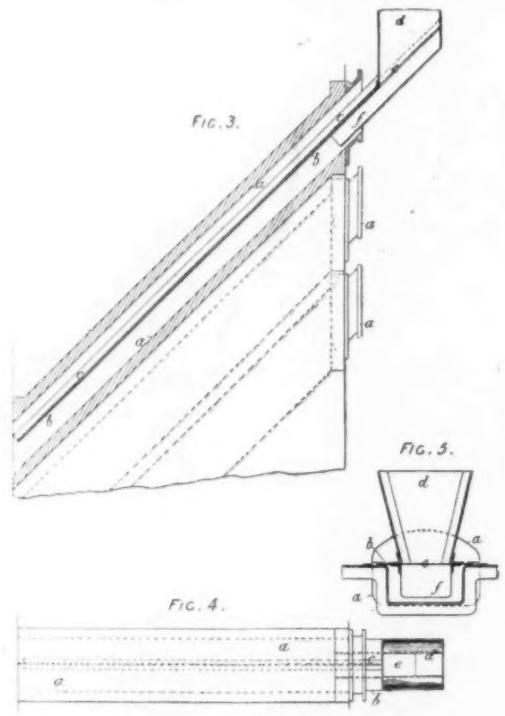
In order that my invention may be fully understood and readily carried into effect, I will describe the accompanying two sheets of drawings, reference being had to the letters marked thereon.

Figures 1 and 2 are front sectional end views of inclined gas retorts; and Figs. 3, 4, and 5 are side elevation, plan, and end views, respectively, of a retort on a reduced scale, to all of which my improvements are applied.

In the drawings, *a* represents the retort to be charged with coal, the retort being shown in the small views inclined or set obliquely. In order to overcome the difficulty of spreading the coal evenly, I employ a division plate *b*, which, prior to charging, is inserted into the retort and temporarily divides the same into two longitudinal chambers. The plate *b* has attached to it a strengthening web of metal *c*. These parts in Figs. 3, 4, and 5 are shown connected to a hopper *d*, provided at *e* with a movable door, which divides the hopper *d*, from a chute or trough *f*, fitted below the division plate *b* and formed with it.



In charging retorts set obliquely the operation is as follows: The division plate *b* is placed in the retort so as to divide it longitudinally from end to end, the hopper and chute, where such are employed, occupying a position, as in Fig. 3, with the door at *e* closed. The hopper is preferably just large enough to hold sufficient coal to charge one retort, so that when the hopper is filled and the door *e* opened the charge of coal passing through the chute *f* into the retort will be spread evenly along its whole length. The division plate and the hopper are now



drawn forward ready to be used in charging another retort, while the filled retort is ready to have its mouth made up in any suitable manner. The plate *b* may be curved in any desired direction to suit the retort to be charged and the quality of coal used. For example, the plate *b* is shown straight in full lines and curved in dotted lines in Figs. 1 and 2, while the retort *a* is shown in Fig. 1 of D section and in Fig. 2 nearly oval.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. The combination, with an inclined gas retort, of a movable division plate extending the full length of the retort and dividing said retort into two longitudinal divisions, a strengthening web *c*, and a hopper provided with a movable door, substantially as set forth.

2. The combination, with a gas retort, of the movable division plate *b*, extending the length of the retort, and a hopper connected to the upper end of said plate, substantially as and for the purposes specified.

Electricity at the World's Fair.

The *Western Electrician*, in a recent article on this subject, says that the specifications for the arc lighting and motor service for the World's Columbian Exposition have now been issued, and the specifications for the incandescent lights will be out in a few days.

Proposals for furnishing the plant, which will be leased by the Exposition, will be received by Mr. D. H. Burnham, Chief of Construction, 1143 Rookery, Chicago, until noon of March 15th in the case of the arc lights, and until noon of March 18th for motor service.

The arc light contracts will be for the "general illumination of the grounds and main buildings," and the total capacity required is about 5,000 lamps for interior lighting and about 1,000 lamps for the illumination of the grounds. The machinery and apparatus required comprise dynamos, with full complement of station apparatus, including switch-board; also lamps, opalescent globes and globe nets. The erecting of machinery and apparatus in position, the external circuit, and connecting the latter to switch-board and lamps are not included in the specifications.

All systems and generators of any capacity are eligible. Generators may be operated in series, but it is not desirable to operate any circuit at a difference in potential exceeding 3,000 volts. The lamps may be of any candle power, but units of 2,000 nominal candle power are preferred. Ten per cent of the lamps shall be capable of burning at least 14 consecutive hours without removing the carbon. The circuits will be erected and maintained by the Exposition, although until lately it was supposed that the contrary would be the case. The successful bidder shall furnish one competent lamp man and one competent dynamo man to supervise the installation, operation and removal of the plant. The erection will be done at the expense of the Exposition authorities. The lessor shall deliver the machinery and apparatus furnished under the specifications free on board cars at Jackson Park, as follows: One-third of the capacity not later than July 1, 1892; one-third of the capacity not later than August 1, 1892, and the remaining one-third not later than September 1, 1892. The machinery and apparatus supplied may be listed and classified as an exhibit by the national commission of the World's Columbian Exposition, subject to the rules and regulations governing exhibits. The bids need not necessarily be for the whole number of lights, and the bidders are requested to state the terms at which they will furnish capacities up to 500, 1,000, 1,500, 2,000 or more lights.

The four sets of specifications for motor service include merely the generators and accessories and not the motors and circuits. The generators must be of the direct current constant potential type, with a maximum electromotive force of about 550 volts. The motive power, with connections to the generator pulleys, will be furnished complete by the Exposition. The general requirements are the same as for arc lighting, except that all the machinery and apparatus must be delivered at Jackson Park not later than September 1, 1892. Proposals should state specifically the price at which the lessor will agree, if required, to supply within three months after date of order additional capacity of generators and apparatus not to exceed 25 per cent. beyond the amount stated in the specifications. The Chief of Construction reserves the right to accept only 75 per cent. of the capacity in generators specified, the contract price in that case to be reduced pro rata. The total capacities of the four power plants and the minimum capacity of each generator are as follows:

Manufactures and sundry other buildings—Total, 800 kilowatts; smallest generator, 100 kilowatts.

Machinery and agricultural buildings—Total, 900 kilowatts; smallest generator, 100 kilowatts.

Mines and mining building—Total, 600 kilowatts; smallest generator, 80 kilowatts.

Transportation building—Total, 300 kilowatts; smallest generator, 50 kilowatts.

All bidders must furnish suitable bonds.

The temporary power and lighting plant for the work of construction now going on at Jackson Park is giving great satisfaction. Twelve motors, varying from 9 to 25-horse power, are now in operation on the grounds, principally employed in driving sawmills. This is one of the largest isolated electric power plants in the United States, possibly larger than any other. Arc lamps to the number of 100, and 350 incandescent lamps, are now wired, and nearly all of these are burned nightly.

Work on the electricity building seems to lag somewhat behind that on the other structures, although operations are continuously carried on. Twelve steel roof trusses were placed in January. Contractor Johnson is installed in a temporary office erected on the flooring of the great building. The roof of the building will consist of 80,000 square feet of canvas, 150,000 square feet of composition, and 52,000 of glass skylights.

The Thomson-Houston exhibits at the World's Fair will be in charge of a committee of the leading experts employed by the company. This committee will include F. B. Badt, of Chicago, and Lieut. Spencer, of Lynn, together with other gentlemen representing the various departments. The company promises to make an elaborate display of commercial apparatus, with many novel features.

A meeting of the Committee on Electrical Congress, World's Congress Auxiliary, was held on February 2d at the Auxiliary headquarters. Prof. Gray presided, and there was considerable discussion. Prof. H. S. Carhart, of the University of Michigan, was elected secretary of the committee, and F. W. Cushing was chosen as assistant secretary, as Prof. Carhart resides outside of Chicago. Prof. Gray is preparing an address to the electrical fraternity of this country and Europe, setting forth the aims of the congress, and it was decided to refer this document when completed to a sub-committee yet to be appointed.

Chief Burnham, of the bureau of construction, has recommended that the Committee on Grounds and Buildings set aside a space 150 × 300 feet for an exhibit of the illuminating and fuel gas industries of the country. The building will probably be located southeast of Machinery Hall, at the southern extremity of Jackson Park. C. K. G. Billings, President of the Peoples Gas Company, Chicago, wants to furnish gas for lighting the north end of Jackson Park during the World's Fair. In order to secure the privilege he is willing, it is said, to put in the entire plant at his own expense, and also remove it without cost, at the close of the Exposition. He will furnish the gas at 90 cents per 1,000 feet. There is some talk of lighting the State buildings at the north end of the park by gas.

The prospectus of the department of electricity, which was issued some days ago, is short, but contains all the information that the directors think needful for exhibitors in this department. The scope of the department is stated to be "the demonstration in actual operation of the commercial and economic applications of electricity. It is desired, however, to made exhaustive tests of electrical apparatus in all possible directions with a view to establishing the actual efficiency of the same in comparison with other and older methods of accomplishment." Object lessons showing the development of the science and art from their earliest stages by means of a historical exhibit are also contemplated.

In relation to the lighting of the grounds, it is stated that about 8,000 arc lamps of 2,000 nominal candle power each, and about 130,000 16-candle power incandescent lamps will be needed. Besides this, from 3,000 to 3,500 horse power will be required for the operation of the machinery of exhibitors. This will be transmitted by electricity from the central power station. In relation to this central station the prospectus says: "To furnish and transmit this 24,000 horse power the Exposition Company will construct a plant which, though a complete station in itself, will be composed of a number of smaller complete plants, installed by those who contract to furnish certain parts of the service. These plants will be primarily for the service of the Exposition, but are not for that reason prohibited from becoming competitive exhibits as well, provided the usual course is taken by their owners of making the proper application of exhibitors, through the office of the Director-General."

Electric power, it is expected, will be used for the intermural railway that will constitute a part of the service of the Exposition, although this question has not been definitely settled. Arrangements for exhibition of electric cars in operation will also be made, although the necessary space has not yet been located. Displays of electrical mining and metal working machinery will constitute an important portion of the exhibits in the department.

In relation to artistic lighting effects the prospectus states the small chambers illustrating varied effects promise to be popular with exhibitors, and all proper aid will be extended by the department, which looks for the best possible results.

The concluding paragraph of the general statement is as follows: "It is superfluous to add that every possible field of electrical work will be liberally considered, and that all systems of all countries will be placed as favorably as possible, to the end that the best results may accrue to the electrical people and the public at large."

The electrical building is described, and also the manner of securing space by applying to the Director-General of the Exposition. In reference to the installation of exhibits it is stated that all electrical apparatus, excepting generators and the adjuncts of the generating plant, must be shown in the electrical building, where electrical power only will be furnished. Generators to be operated by steam power can not be in-

stalled in the electrical building, but must be located at some other point.

Alluding to the much talked-about question of the relation of electrical exhibits and the service plant the prospectus says: "The power station will contain the plant under contract to serve the Exposition, and will probably contain the generators of those exhibitors who contemplate exhibiting generating plants of sufficient capacity only to operate the balance of their exhibits in the electrical building. Steam power for the running of these generators will be furnished by the Exposition company at a moderate price, the figures to be fixed hereafter. In the event that it be found undesirable to combine the actual service machinery with the purely exhibitive generators some acceptable site will be found for the latter within reach of power. Appliances and apparatus, such as electrical elevators, search lights, etc., intended for exhibition, but offered and accepted for the service of the Exposition, may be installed wherever their service is required without forfeiture of their rights as competitive exhibits, provided that such outside location shall have been approved by the Director-General."

Ample facilities will be provided for moving pieces of machinery weighing not more than thirty thousand pounds. Any article weighing more than this will require an extra charge for installation. Empty packing cases may be stored at a maximum rate of 2 cents per cubic foot; with insurance, 2½ cents will be charged for this service.

Foreign exhibits may be entered free of duty, in bond. If sold the regular duty will be collected.

In conclusion it is stated that the officers of the Exposition must for obvious reasons assume arbitrary power in the acceptance of exhibits and the allotment of space. This power, however, will be exercised with the view to aiding the greatest possible number of exhibitors to make the most of the opportunity afforded by so great an Exposition.

Gas Fired Boilers.

The *American Manufacturer* has frequently referred to the relative economy of gas and coal fired boilers, and has asserted that while gas would no doubt be more economical in a badly constructed and operated fire box under a boiler, that with the best type of boiler there was little or no economy in using gas, that coal gave as high a percentage of theoretical efficiency when burned as coal as when it was burned as gas.

There is at present no little interest taken in England in gas fired boilers as a smoke preventive. Mr. A. E. Fletcher, the chief inspector of alkali works of Great Britain, has frequently discussed the subect at length. London *Engineer*, in commenting on Mr. Fletcher's statements, says:

In one of his reports, published a few years ago, Mr. Fletcher said that "fuel in the form of gas settles the entire question of smoke." This is true if the gas is burned under favorable conditions; but with ordinary producer gas, made from bituminous coal, smoke as thick and black as any from a coal fire may be produced with a badly regulated air supply. Nor is the adjustment of the air to the gas supply quite so simple as it may appear, as the quality of generator gas is apt to vary considerably from time to time. However, as with a reasonable amount of care the combustion may be effected in a practically smokeless manner, we may concede that the general application of gas firing to boilers would do away with the smoke from their chimneys. In the same report reference is made to the employment of generator gas, from which the hydrocarbons and nitrogenous constituents have been removed, such gas being incapable of producing black smoke under any circumstances. But the recovery of these bye-products involves the total loss of the sensible heat of the gas, which would otherwise be carried forward to the boiler, minus the inevitable losses from conduction and radiation. As the sensible heat of the gas leaving the generator represents something like one-third of the total calorific power of the fuel, it is plain that the products obtained must, after paying all expenses of recovery, be of sufficient value to compensate for this loss. The only product of any value is the sulphate of ammonia, and we believe that those conversant with its recovery will agree that the process has yet to be devised which will enable ordinary coal consumers to make the manufacture of ammonia sulphate a profitable branch of their business. Moreover, the price of this valuable fertilizer shows a continued downward tendency. Its present price of between £10 and £11 per ton is less than half of what it was only a few years ago, and any increase in the supply must still further depress it. The tar obtained from gas produced by the partial oxidation of fuel, like generator gas, is essentially different from gas works tar, produced by destructive distillation. It contains no benzole nor anthracene oils, and is, in fact, almost valueless commercially.

Some of the earliest gas plants especially erected for firing boilers were put down in the neighborhood of London about 10 years ago, with a view to the avoidance of smoke prosecutions, and, so far as we are aware, they are still in operation. In 1883 a series of trials was made at a large colliery near Wrexham, in Wales, to determine the relative merits of hand and gas firing. Two Lancashire boilers, 27 feet long by 7 feet diameter, and precisely similar in every respect, were used for the experiments. They were fed with cold water, and were not fitted with any kind of economizers. A producer of the Wilson type was used in conjunction with the gas fired boiler, the coal in both cases being refuse from the screens. The average results, as recorded by one of the partners in the colliery, showed a greater absolute efficiency of 9.85 per cent. in favor of gas firing, or a net efficiency, after allowing for the steam consumed in blowing the producer, of 4 per cent. At the same time, the gas fired boiler made 26.9 per cent. more steam, after deducting the steam used for the jet blower, than the hand fired boiler. These results encouraged the proprietors to apply gas firing to a battery of 7 Lancashire boilers, which remained at work for a number of years, though we understand that hand-firing has now been resumed in order to utilize a description of fuel found to be unsuitable for gas making.

In November, 1886, Mr. D. K. Clark conducted a trial of 4 Cornish boilers fired by gas obtained from 2 steam jet blown producers of ordinary vertical type. The trial lasted 5 hours, and the result, as compared with a 6 days' test of hand firing which had previously been made, showed an advantage in favor of gas-firing of 5½ per cent., after making allowance for the steam consumed by the producers. The speed of evaporation was also shown to be considerably greater with gas than with hand firing.

Somewhat later the engineers of the Birmingham Compressed Air Company made a series of trials with the gas fired boilers at the Butterly Company's works at Codnor Park. On the strength of the results 7 gas producers were erected at the compression station in Birmingham to supply gas for 9 Lane boilers; but we are informed that gas firing has now been discontinued, on account of the large consumption of fuel.

In the year 1888 there were probably about 80 steam boilers in different parts of the country fired by gas derived from plants specially erected for the purpose, and we very much question if there has been any increase in the number. The results of trustworthy trials and general experience with this method of steam raising show, as Mr. D. K. Clark has stated, two things, viz., that gas firing makes more steam than hand firing, and that it evaporates a little more water per pound of coal. These are undoubtedly advantages; but in consideration of the extra first cost and maintenance of the gas plant, and the space it occupies, it is hardly surprising that they have not led to a wider application of gas firing to steam boilers. Moreover, as gas firing gives little or no economy over hand firing in the matter of labor, it has little chance of competing successfully with the newer systems of mechanical stoking, which claim to be smokeless in action.

Gas and the Electric Light.

Mr. John Gill, C. E., in the course of a lecture delivered before the Peterborough (England) Scientific Society, introduced his subject by remarking that his only purpose was to make some comparison of the energy taken from the coal at the commencement and that delivered at the end as light, and then went on to say:

From the last Board of Trade return on the manufacture of gas in the United Kingdom we find that in the year 1890 the total quantity of coal used for the manufacture of gas amounted to 10,240,000 tons, and this coal produced 103,100 millions of cubic feet of gas. This gives an average of 10,066 cubic feet of gas for each ton of coal. The total heating power of 1 lb. of coal of average composition amounts to 14,320 units—1 English thermal unit being the heat required to raise 1 pound of water 1° F., and is equal to 772 foot-pounds of work. The average quantity of coal used in making 1 cubic foot of gas is, from the foregoing figures, 0.222 lb., and allowing 5 cubic feet to give 16-candle power for one hour, we get 11,520 foot-pounds energy in light from each 1.11 lbs. of coal. But each 1.11 lbs. of coal contains originally 12,059,412 foot-pounds of energy, so only 0.095 per cent. of the mechanical energy in the coal is utilized, or we may say the efficiency of coal gas is 0.095 per cent.

Turning our attention now to lighting by electricity, the average consumption of ordinary coal used for the steam engines employed to drive the dynamos in central station lighting may be taken at 2½ lbs. per horse power per hour. Each horse power at the engine therefore absorbs 35,800 units of heat per hour, or 27,637,600 foot-pounds of work. Now, an incandescent electric lamp of 16-candle power requires 60 watts of electricity per hour. The mechanical equivalent of one watt of elec-

tric current being 44.2 foot-pounds per minute, the 16-candle power lamp uses 159,120 foot-pounds per hour. One horse power would therefore supply 12.4 lamps each of 16-candle power for one hour, or a total of 198 candles, which, at 12 foot-pounds per minute, would have a mechanical equivalent of 142,560 foot-pounds per hour. But we have seen that to get this energy at the lamps we have used coal at the boiler the energy of which amounted to over 27 million foot-pounds, and working it out exactly the efficiency is 0.516 per cent. The respective efficiencies of coal gas and electricity are, therefore, coal gas 0.095 and electricity 0.516 per cent., the proportion being as 1 to 5.4. Both processes seem at first sight to be exceedingly wasteful, as by the better of them there is less than 1 per cent. of the energy in the coal utilized, while more than 99 per cent. is wasted. But the great object of this comparison is to show that electricity will give five times more light than gas from the same amount of coal; or, to put it another way, 1 lb. of coal will give 5 times as much light when used through a steam engine and dynamo as when made into gas. This fact must, in course of time, tell in favor of electricity, because as the coal has to be won from greater and greater depths it must become more and more costly, and any increase in the price of coal will affect the cost of gas more than that of electricity.

Gas, as you are all aware, is sold by the 1,000 cubic feet, but electricity cannot be so measured, and a new unit has had to be adopted. Electricity is therefore sold by the "Board of Trade unit," which is more conveniently known as the kilowatt, and is, as the name implies, equal to 1,000 watt hours. But perhaps some of you may ask, "What is a watt?" To express it as simply as possible a watt is the electrical energy developed by a current of 1 ampere at a pressure of 1 volt. These terms, I am afraid, seem rather formidable, but that is only on account of their strangeness. When electricity came to be a commodity of daily use it was necessary to have fixed units of measurement, but as it could not be measured by either the gallon or cubic foot, or weighed by the pound, new units had to be determined, and these have now become legal standards. The time is coming when every ordinary mind will have a fixed idea of a watt of electricity just as it has now of a gallon of water, a pound of soap, or a yard of ribbon. For the present purpose it is sufficient to bear in mind that the electrical energy of one watt is $\frac{1}{746}$ part of a standard horse power. We have seen that an electric glow lamp of 16-candle power requires 60 watts per hour of electricity. For 1,000 watts we should therefore have 265 candles. Taking each ordinary flat flame gas burner to give the light of 12 candles for every 5 cubic feet of gas consumed per hour, we should have 2,400 candles for each 1,000 cubic feet of gas. The ratio between the lighting power of 1,000 cubic feet of gas and 1 kilowatt of electricity is therefore as 9 to 1, and to be of equal cost, light for light, the price of 1 kilowatt of electricity should be one-ninth of the price of 1,000 cubic feet of gas. With the price of gas at 5s. 4d. per 1,000 cubic feet, as in Peterborough, the price of electricity to supply the same light at the same cost should be 4½d. per kilowatt or Board of Trade unit.

At Newcastle-on-Tyne the price is 4½d. per kilowatt, and, therefore, electricity is sold at Newcastle at the same cost, light for light, as gas at Peterborough. But it is hardly fair to want the electric light supplying at the same price as gas. It is so much brighter, purer, cleaner, healthier, and safer that its market value is higher. Thus we find that there is a great and constantly growing demand for electric light in Bradford, where it is sold at 6d. per kilowatt, although the price of gas is only 2s. 3d. per thousand cubic feet.

The advantages of a purer means of artificial illumination are very apparent to those who use electricity. There is no burning up of the oxygen required for breathing; there is no giving off as products of combustion or poisonous gases, or other objectionable compounds to injure health and damage furniture. Electric lighting has, therefore, large collateral economic advantages when compared with gas. We may pursue this subject a little further by inquiring whether the present price of electric lighting will be maintained, or whether there is any prospect of its being cheapened; and the reply may be given with the greatest certainty that electric lighting will become much cheaper than at present. There is no probability of the methods or machinery used for generating and distributing the current being much improved. The day of experiment is passed, and the permanent electric lighting plants now being erected are amongst the most efficient of machinery. But there is a monopoly in the manufacture of the glow lamps which keeps up the price. Two years hence the Edison-Swan patents will expire, and the mauufacture of glow lamps will become an open trade. Their cost will then be considerably reduced, whilst there is also a promise of their efficiency being increased. Another reason why we may safely predict a lowering in the price of electric lighting is that the interest on capital and the maintenance expenses of a large central station plant are just as heavy when only supplying one third of their full capacity of lamps as they are when running with a full load. This is just what is happening now, and the electric lighting industry is passing through that season of heavy outlays and small returns through which every new industry has to pass. We know that this experience was exactly the same with gas when it was first introduced.

We know that gas companies who are now paying handsome dividends failed to realize any profit at all during the first years of their existence, although the prices they charged were more than double the present prices of either gas or electricity. When we think of the 61 millions of money invested in the gas manufacturing industry of Great Britain, and remember how much human nature there is in a man, we cannot feel either wonder or surprise that the electric light is not on all occasions and in all places received with open arms; but whether we like it or not, there can be no denying the fact that the year just closed has been one of extensive and solid progress in electric lighting.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE East Chester Gas Company, of Mount Vernon, N. Y. (the Company for some time back has been under the control of the American Gas Company, of Philadelphia) is distributing to the residents copies of Mr. C. J. R. Humphreys' common sense pamphlet entitled "Gas as a Source of Light, Heat and Power." General Manager Ramsdell knows the value of printer's ink as an aid to making converts; and the Humphreys' tract has already done much missionary work in turning the thought of the queens of the household to the value of gas fires, whether in the kitchen range or in the direction of what might be termed "detached heating."

THE Harrisburg Gas Coal Company has been chartered by capitalists who nominally are residents of Greensburg—the capital seat of Westmoreland County, Pa.

LAST week mention was made of an amendment to the work of the Statutory Revision Commission of this State, under which it was suggested that the Brooklyn Gas Companies could charge $1.50 per 1,000 cubic feet instead of the $1.25 rate which has prevailed there since the Porter Census determined the fact that Brooklyn was possessed of over 800,000 inhabitants. Those who gave any thought to the proposition, however, differed with that view, as the Brooklyn Companies, having sold gas at the $1.25 rate for several months without contesting the validity of the State law in the courts, evidently determined to make the best of the situation as it was and is. Such conclusion would seem to have been arrived at formally by the Companies, for recent issues of the Brooklyn newspapers contain disclaimers from the managers of the Fulton-Municipal, Brooklyn and Williamsburg Companies of any intention on their part to increase the gas rate. They claim that it would be against "public policy" to so do; and it undoubtedly would.

CAPTAIN W. H. WHITE has accepted a contract to construct a single-lift gasholder for the Freehold, (N. J.) Gas Light Company. Its dimensions are to be 48 feet by 17 feet.

THE Committee of Manufactures, Massachusetts Legislature, recommend that the standard of illuminating values of gas distributed in the State be raised to 16 candles. This is an increase of 1 candle; but as the State adheres to the old test burner, in reality this is saying that the gas shall average 18 candle power.

The following letter is from Mr. H. M. Cross, who writes from the Rialto Building, Boston, Mass., under date of the 11th inst.

Facts about Boston Gas Companies.—The Companies operated by the Bay State Gas Company, of Delaware are:

	Capital.	Assessed Values.
The Boston Gas Company.....	$2,500,000	$4,457,200
The Dorchester Company.....	400,000	298,400
The Roxbury Company.....	600,000	633,500
The South Boston Company....	440,000	386,300
Bay State of Massachusetts.....	500,000	631,500
Total.....	$4,440,000	$6,406,900

The Bay State, of Delaware, upon the above property—

$7,000,000	first mortgage 5's.
3,000,000	second " 5's.
2,000,000	income " 7's.
5,000,000	stock, at $50 par value.
Total.. $17,000,000	

Of this amount the first and second mortgages represent the real money paid for the properties at prices far above their real market values, and including commissions and discounts on bonds. The income bonds and stock represent no money paid in, and are, in the language of the stock board, "wind and water" only. All the territory now occupied by the combined Companies can be served by a new Company, with works having a capacity of 10,000,000 cubic feet of gas per day, and at a construction cost of $7,000,000, or less. Gas capitalists desire a charter to construct such works, and will contract to furnish gas of one-third greater candle power and heat value than the gas now furnished by the Addicks Companies, and at a cost not exceeding $1.25 per 1,000 in all sections of the city now occupied by the Delaware Companies, or $1 for such gas as is now supplied. The Delaware Company is actually paying the interest on $12,000,000, and is earning now fully 4 per cent. on the $5,000,000 of stock, and the officers of the Company are quoted as saying that they will soon be earning 7 per cent. on the whole amount of income bonds and stock. The only way in which income can be earned by a chartered Company on $7,000,000 of "watered" stock is by excessive charges upon the customers of the Company. The Boston Gas Company is charging its customers $400,000 per year, or more than $1,000 per day, in excess of what would be needed to pay 10 per cent. on its capital stock. It is doing this by hiring from the Bay State Company, of Massachusetts, its pipes at an annual rental of $100,000, and it is buying gas from that Company at $1 per 1,000 cubic feet, which the Bay State makes for 35 cents. In the published reports for the current year it appears that the Bay State, of Massachusetts, with a plant which cost $700,000, earned $450,000 in the year ending June, 1891. That is, the Boston Gas Company is paying out $450,000 per year for the use of facilities which it could own for $700,000. The Boston Gas Company can hire money at 4½ per cent., and it also has a large amount of real estate which it could sell to provide money to build all the added facilities needed. The evidence submitted proves beyond question that the Boston Gas Company is taking $1,000 per day wrongfully from its patrons, and in a manner which the Legislature will not tolerate. As to the price of gas elsewhere. Mr. Addicks is fighting to get into Wilmington, Del., with a new Company, and offers to sell gas at 75 cents per 1,000 cubic feet, in competition with the Wilmington Company, which is selling gas at $1.12 per 1,000, and paying 12 per cent. dividends. The price of gas depends largely on the amount consumed per mile of pipe, and the Boston Gas Company is selling more gas per mile of pipe than any other Company in the world, and three times as much per mile as in Wilmington and Lowell. Nothing prevents the Boston Gas Company from selling gas at $1 per 1,000 except its connection with the Bay State. Proceedings to terminate this connection are now pending before the Legislature in behalf of the gas consumers of Boston.

THE plant of the East St. Louis (Ills.) Gas Light Company is to be virtually reconstructed, and the contracts for the work have been awarded. The new plant will have a capacity of from 250,000 to 300,000 cubic feet per diem, or about 4 times that of the present works.

THE plant of the Peoples Electric Light Company, of Birmingham, Alabama, was sold at auction recently under foreclosure proceedings. The purchaser was Col. J. F. B. Jackson, whose bid was $15,300. It is hinted that the Colonel was acting for the local Consolidated Electric Light Company.

SOME days ago the Hon. "Tim." Campbell, of New York city, introduced in Congress a bill incorporating the Metropolitan Gas Light and Fuel Company, of the District of Columbia. The incorporators named in the bill are John G. Slater, George W. Quintard, T. E. Roessle, E. N. McKinney, E. O. Roessle, Henry Brock and Frederick B. Bard. The capital stock is not to exceed $2,000,000, and the affairs of the Company shall be administered by seven Directors, who shall have power to dispose of bonds with the consent of two-thirds of the stockholders. Nothing but money or property estimated in good faith to be of equivalent value shall be received in payment for stock. The incorporators named shall form the first Board of Directors, holding office until the second Monday in January, 1893. The Company is authorized to make and sell gas, to be made of coal, oil, naphtha, tar, peat, pitch, or turpentine, to be used for lighting and heating the city and district, and to lay mains and pipes through streets and alleys, subject to regulations of the Commissioners. Interference with the Company's property is prohibited. The act does not prevent any other Company from obtaining a charter from Congress, and is liable to repeal. The stockholders are liable, jointly, severally and individually, for all debts due employees, and until the whole amount of capital stock shall have been paid in the stockholders shall be individually liable to the amount of stock held by them respectively.

THE Pulaski Gas Light Company, of Little Rock, Ark., has formally accepted the ordinance passed by the City Council on January 11, last.

THE Central Gas and Water Company has been incorporated by Messrs. Charles O. Buckland, W. J. Phillips, S. T. Dodson, Sr., T. B. Key and S. T. Dodson, Jr. It is capitalized in $300,000, and its proposed field of operation is San Joaquin County, Cal. This may mean some reorganization of the Stockton (Cal.) Gas Light Company.

THE Chester Pipe and Tube Company, of South Chester, Pa., have placed a contract for their new building with The Berlin Iron Bridge Company, of East Berlin, Conn. The building will be 52 feet in width by 170 feet in length, and will be constructed entirely of iron—not a bit of woodwork will be seen in the structure.

MANAGER STOCUM, of the Tonawanda (N. Y.) Gas Light Company, is very much interested in pushing the sale of gas for purposes other than lighting. The Company advertises liberally in the local papers the fact that it is carrying in stock a large line of gas cookers and heaters, which it offers for sale at manufacturers' lowest net prices, and that it will place any stove selected without cost to the user for fittings, etc., the same to remain on trial for 30 days. If at the expiration of the trial the user decides not to retain the stove, the Company will remove the same, the user to be charged only with the quantity of gas consumed in the trial period. The increase in the Company's output over that of a year ago is very satisfactory, notwithstanding the efforts of the local electric light suppliers.

THE Tonawanda Company's net selling rates, when bills are paid in 10 days, are:

200 feet and under, each meter.....	$1.50	per M.
300 to 900 feet, inclusive, each meter..	1.45	"
1,000 to 2,900 feet " " ...	1.40	"
3,000 to 6,900 " " " ...	1.35	"
7,000 to 11,900 " " " ...	1.30	"
12,000 and over, each meter.....	1.25	"

AT the annual meeting of the Portsmouth (N. H.) Gas and Electric Light Company the following officers were chosen: President, John Sise; Clerk and Treasurer, Frank J. Philbrick; Directors, John Sise, Marcellus Eldredge, Edmund S. Fay, W. W. Cotton and H. Fisher Eldredge; Superintendent of gas works, Thomas R. Martin; Electrician, F. T. Flannagan.

MR. G. H. SNAPPER HOOKEY, the Superintendent of the Augusta (Ga.) Gas Company was about the jolliest looking man in Georgia when the stockholders were listening, in annual meeting, some days ago to the figures read to them from the reports of the officers showing the results of the year's working. He ought to be jolly and they ought to be satisfied, for the increase in sendout was the largest ever reported in any twelvemonth of the Company's history (now in its 41st year), and the corporation was a dividend payer in its infancy. The election resulted as follows: Directors, George T. Barnes, E. R. Schneider, P. H. Langdon, T. G. Barrett and Patrick Walsh; President, George T. Barnes; Secretary, H. B. Adam.

PROFESSOR WILLIAM E. GEYER, of the Stevens Institute of Technology, was recently retained by the authorities of Plainfield, N. J., with instructions to test the candle power of the electric street lights with which the city is lighted. His report showed that none of the lights were within 70 per cent. of the contract rating, and that many of them were 50 per cent. under the stipulated value.

THE offices of the Hackensack (N. J.) Gas Light Company have been removed to a handsomely fitted-up store close by the station of the New York, Susquehanna and Western Railroad Company. The offices are heated by gas, and provision has been made for an elaborate display of gas cooking and heating stoves, etc. This change will be appreciated by the Company's customers; for it formerly "received" in a small, dingy room at the rear of a cigar store, located fully one-quarter of a mile from the railroad station. That the new management mean to increase the sendout largely is shown by their action in ordering a reduction in the gross rate to $2.50 per 1,000, prompt payment to secure a rebate of 50 cents per 1,000—the discount date is open for 15 days, which

surely is liberal enough. The new rate takes effect on March 1st. The former schedule was:

Monthly Consumption.	Rate per M.
Under 5,000 cubic feet	$2.50
Between 5,000 and 10,000 cubic feet	2.25
Over 10,000 cubic feet	2.00

As at least 90 per cent. of the Company's business was with the two grades first named, it can readily be seen that the cut is a heroic one.

THE Stacey Manufacturing Company has been awarded the contract for the new three-lift gasholder to be added to the plant of the Buffalo (N. Y.) Citizens Gas Light Company.

ACCORDING to the report of the Superintendent of the City Gas Works, Danville, Virginia, the business yielded a net profit for the year ended December 31, 1891, of $7,181.05. On the strength of this, the Light Committee recommends the City Council to reduce the selling rate to $1.25 per 1,000 cubic feet, a concession of 25 cents per 1,000.

IF Danville can afford to sell gas at $1.25 per 1,000, is it not about time that the Philadelphia authorities saw their way clear to the point of selling gas at $1.35? The Quaker City ought, we suppose, to have a *little* the better of it.

THE Berlin Iron Bridge Company, of East Berlin, Conn., has taken the contract for a new boiler shop for the Dry Dock Engine Works, at Detroit, Mich. The building, which is to be 68 feet in width by 201 feet in length, is to be designed and built solely from the designs furnished by the Bridge Company, and the latter not only furnishes the iron-work, but takes over everything connected with the structures—the foundations, brickwork, and so on.

WE are indebted to "Observer" for the following, from the Salem (Mass.) *Register*, date of 11th inst.: "The annual meeting of the stockholders of the Salem Gas Light Company was the most largely attended one in the history of the Company. The gathering was a very lively one, as the younger element made a determined effort to change the present regime and to oust the Treasurer and also the Superintendent. There were 2,499 shares represented out of a total of 3,000, and Col. Henry A. Hale presided, while Mr. B. W. Sluman acted as Clerk. The contest for Treasurer, which position has been held by Mr. David W. Moore for upward of a quarter of a century, was sharp. Last year the election was settled by acclamation, but this year the younger element insisted on a stock vote. Mr. Moore's supporters rallied loyally, and the conservative side won, re-electing the Treasurer by a vote of 1,299 to 1,029. The vote opened the eyes of the senior element and the result was a sharp contest for Directors. In the choice of a new Board, Mr. Moore, who was a Director last year, was defeated on a close vote, though he would not have been, possibly, if some proxies had been voted upon that had been brought to the meeting, but were not offered in the contest. The Directors elected were Col. Henry A. Hale, John P. Langmaid, J. Hardy Towne, S. W. Winslow and B. F. Fabens. The Board may not be as harmonious as in the past, but the policy of the management, from the complexion of its composition, will, it is believed, not be greatly changed. Mr. Winslow is the one who succeeds Mr. Moore as Director. A motion by Mr. Winslow to repeal the vote whereby the stockholders voted in 1854 that the Treasurer should perform the duties of Superintendent proved a veritable apple of discord. Mr. Towne drew out the fact that Moderator Hale had first suggested the idea to Mr. Winslow, though the latter said he would have done it himself as quickly. Judge Osgood made a very warm speech in behalf of Treasurer Moore, against whom nothing could be said. He claimed that a trap had been sprung, and said he was much surprised at the action of the younger men. Mr. Webb objected to hampering the Directors by unnecessary instructions from the shareholders, and Judge Osgood urged that the motion be withdrawn. It was finally decided to refer the matter to the Directors, with instructions to use their best judgment, with the further understanding that the Board could call a meeting at any time of the stockholders, should a difference arise in the Board of Directors as to the disposal of the proposition to divide the offices of Treasurer and Superintendent. A dividend (semi-annual) of 3 per cent. was declared. From the reports it was determined that during the year 1,108 feet of new mains had been placed, bringing the total up to 27 miles and 4,040 feet. The make for the year amounted to 42,035,000 cubic feet, a decrease of 21,000 feet."

IT is presumed that the "younger element" are disposed to engage the Company liberally in the electric lighting business; but whether so or not, the fact remains that the objectors are indebted to Treasurer Moore for many a dividend in the past that was only made possible through his economical (but never parsimonious) management.

ACCORDING to the Chicago *Tribune* the Economic Gas Company's proprietors have purchased an irregularly shaped block of land bounded by the south branch of the Chicago river on the north, Main street on the west, and Cologne street on the south, for $135,000. This property has been under contract for some time, and on the 11th inst. a deed for the west half of the land was executed from the heirs of Joseph Brown to Sanford B. French. This sale was negotiated by Mead & Coe, and the property transferred is that known as lots 6 and 7. It has a south frontage on Cologne street of 216 feet and a river frontage of 350 feet. The west line on Main street is 400 feet, while the depth along the east line is 541 feet. The entire purchase gives the Gas Company control of a plot 625 feet long, with an average depth of 450 feet to 750 feet of river frontage. It is half a mile west of Halsted street, and 1½ miles due north of the Union Stock Yards. A switch running along the entire front of the property parallel with Cologne street, with two spurs to the river, is connected with the Alton Railroad. At present the land is used as a lumber yard. The location is an exceptionally good one for gas works purposes, as the tract has railroad service and dockage sufficiently extensive to provide for coal and other needed supplies.

MR. DANIEL T. ROOTS, President of the P. H. & F. M. Roots Company, of Connersville, Ind., somewhat surprised his townspeople by stealing a march on them. His plan of campaign was about like this. A ministerial looking gentlemen (nor did his looks belie his calling) was invited to visit the mansion of Mr. Ellis, who resides on South Central avenue, Connersville, on the evening of Saturday, February 6th. He there found Mr. and Mrs. and Miss Ellis, also Daniel T. Roots—others were present but our story does not concern them. When the ministerial gentleman departed Mr. and Mrs. Ellis were still there, and so was Mr. Roots, but Miss Ellis had ceremonially and formally agreed hereafter to be knawn to the world as Mrs. Daniel T. Roots. The wedding journey was to the land of the Golden State. May the best of good luck be their portion.

THE Calumet Light, Heat and Power Company, to supply gas and electric light to the residents of West Calumet, Illinois (a suburb of Chicago, or a part of Cook county, which amounts to the same thing), has been incorporated by Messrs. E. Littlefield, C. B. Matteson and C. F. Barber. It is capitalized in $500,000.

THE proprietors of the Montreal (Can.) Gas Company have passed a resolution ordering a reduction of 10 cents per thousand in the selling rates, the same to take effect on May 1st. This will bring the net price to $1.30.

A PETITION signed by over 5,000 residents has been presented to City Councils of Philadelphia urging a reduction in the gas rate. The petitioners assert that 75 cents per thousand would be a "fair price."

THE Oakland (Cal.) Gas Light and Heat Company has purchased a plot of ground, 100 feet by 150 feet, on the northeast corner of Clay and 13th streets, and will construct thereon a handsome office building. The grounds and structure will cost not less than $100,000.

J. A. PENNEBECKER and wife have brought separate suits for damages against the Ashland (Wis.) Lighting Company, on account of personal injuries resulting from an explosion of gas, which plaintiffs allege was due to the Company's negligence. The total sum prayed for is $50,000. The husband's case (he sued for $25,000) was brought off last week before a jury in the local Circuit Court, and the result was a sealed verdict for complainant, awarding him $9,500. The Company appealed.

THE hearing in the United States Circuit Court for the Cleveland (O.) district, of the Cleveland Gas Companies against the city in the matter of the 60 cent gas ordinance, will be had before Clerk Belford, who has been named as Master by Judge Jackson. Judge Pennywell and Mr. Andrew Squire will represent the Companies. The hearing will likely be searching, prolonged and interesting, as several experts have been summoned on behalf of both interests.

THE shareholders have determined that the Beverly (Mass.) Gas Light Company shall hereafter be known as the Beverly Gas and Electric Light Company.

The Market for Gas Securities.

Consolidated shows no change of moment for the week, the opening price to-day (Friday) having been made at 113¼. Semi-officially we understand that the Company will hereafter pay its dividends quarterly instead of semi-annually, the rate to be 6 per cent. per annum. Standard affairs are still in an unsettled condition. We note a sale at auction of 100 shares Standard preferred at 85⅞. Equitable is strong and higher, while Mutual remains as before.

Over in Brooklyn the situation remains unchanged, although the agitation for consolidation seems to grow more pronounced. Nassau and Citizens are in much demand, at better prices than those of last week. Chicago gas to-day opened at 81⅜, and the outlook is for better prices still. Consolidated of Baltimore is somewhat weaker, but the stock looks to be a good purchase. In Boston, the Addicks specialties are dull, with no immediate prospect of an advance.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

February 22.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	113¼	113½
Central	500,000	50	87	—
" Scrip	220,000	—	95	100
Equitable	4,000,000	100	138	140
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	123	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	38	42
Preferred	5,000,000	100	85	87
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	120	122
Citizens	1,200,000	20	102¼	102½
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	132½	134
" Bonds	300,000		102	—
Peoples	1,000,000	10	82½	85
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	102	105
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	135	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	125	130
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	91¾	92
2d " " "	3,000,000	1000	81½	82
Bay State Gas Co.—				
Stock	5,000,000	50	59½	60
Income Bonds	2,000,000	1000	6	8
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds	45,000	—	—	—
Chicago Gas Company	25,000,000	100	81⅜	81½
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	87½	88
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	97½
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	100	—
2d "	2,500,000	1000	96	—
Consumers Gas Light Co., Jersey City	2,000,000	100	15	20
Bonds	600,000	1000	72½	75
Cincinnati G. & C. Co.	7,000,000	100	—	200
Consumers Toronto	1,000,000	50	169	172
Central, S. F., Cal			90	—
Capital, Sacramento, Cal			58	
Consolidated, Balt	11,000,000	100	48½	48⅝
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	110
Bonds	250,000		—	—

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A SUPERINTENDENT FOR A COAL GAS WORKS,

In a live gas town. Annual output, 17,000,000. Works in good repair. A liberal salary will be paid to a good man. State experience and where last employed. Address

872-2 "GAS WORKS," care this Journal.

ENGAGEMENT DESIRED.

My connection as Superintendent of the Macon Gas Light and Water Company will be severed April 1st. Correspondence invited from anyone requiring the services of a Hydraulic and Gas Engineer. Good references can be given. Address

870-5 J. W. WILCOX, Macon, Ga.

Position Wanted

AS SUPERINTENDENT OR MANAGER,

by a young man with twelve years' experience and a thorough training in all the details of coal and oil gas plants. Address

869-4 "Supt.," care this Journal.

COAL TAR BIDS.

Product of the Danville, Va., Gas Works.

200 to 300 bbls., f.o b. Danville. Address bids, until Mar. 10, to

FRANK TALBOTT, Sec. and Treas.,
Danville Water, Gas & Elec. Lt. Dept.,
872-4 Danville, Va.

WANTED,

One "Standard" Scrubber,

of 500,000 cubic feet capacity. State price, condition, and where located. Address

871-4 "A. B.," care this Journal.

Gas Stock For Sale.

125 Shares of Ogdensburg (N. Y.) Gas Lt. Co.'s Stock For Sale.

Address "OGDEN,"
870-4 Care this Journal.

FOR SALE,

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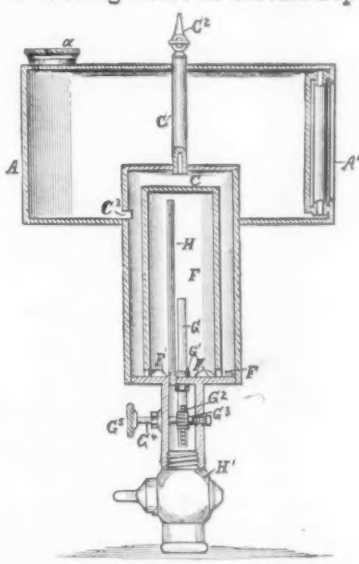

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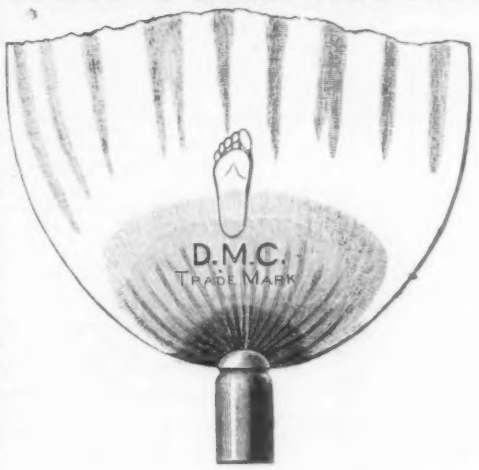

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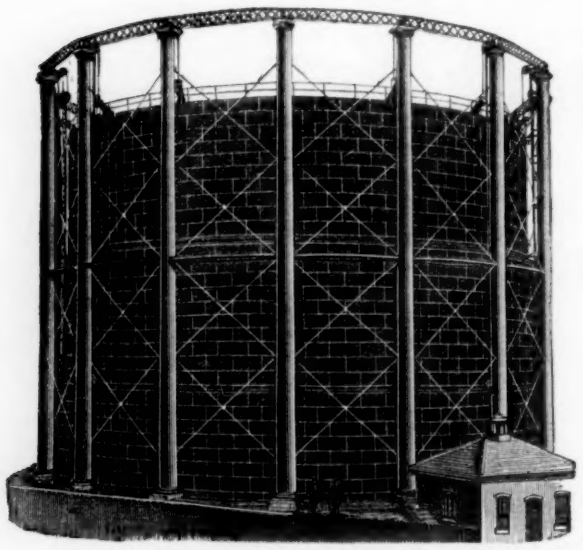

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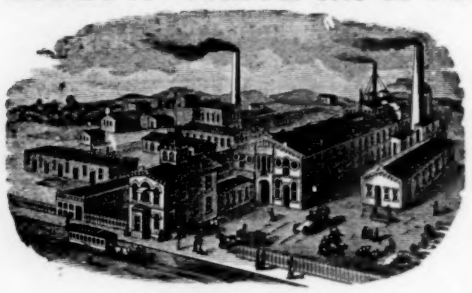

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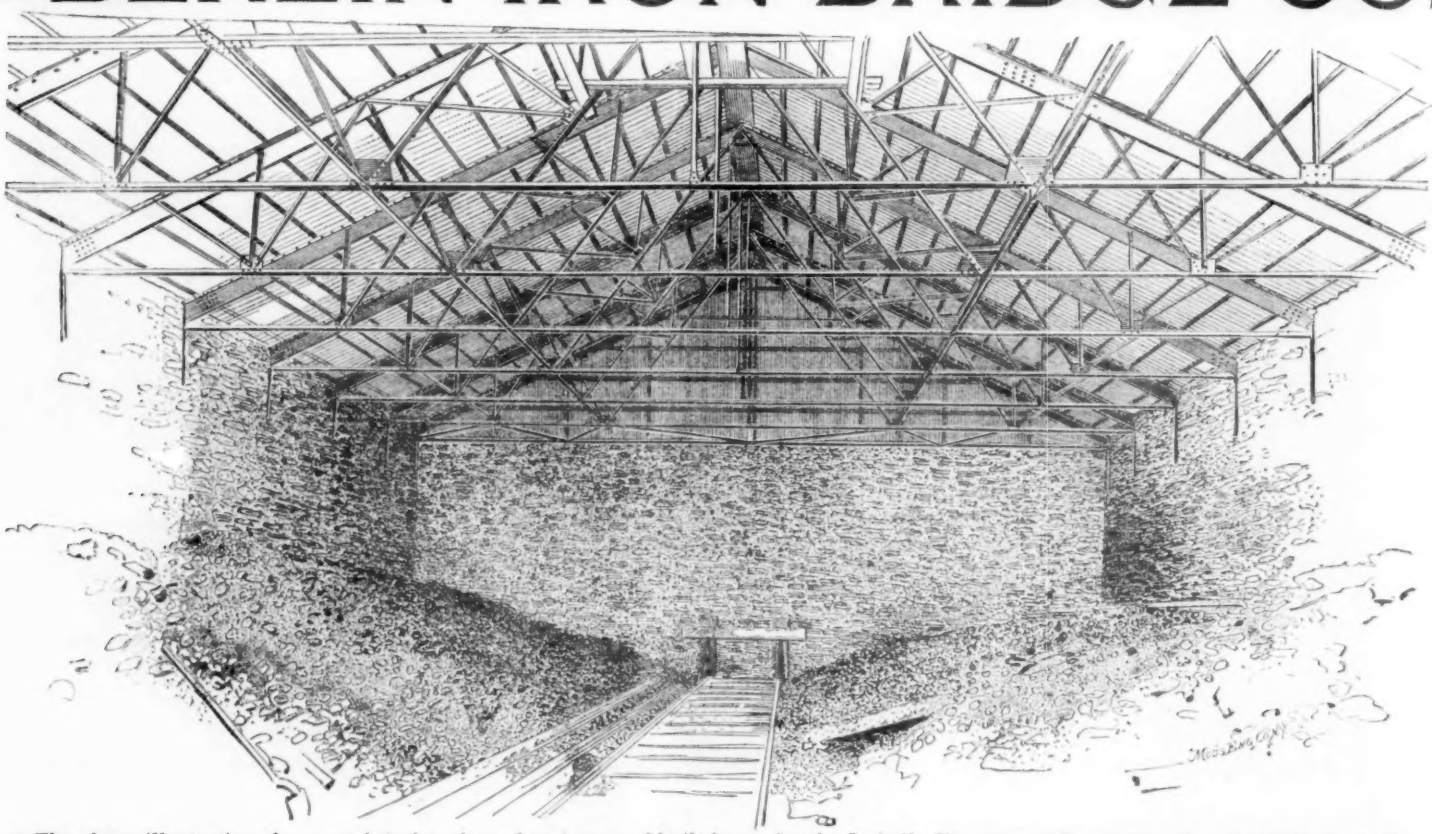

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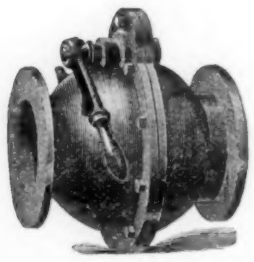

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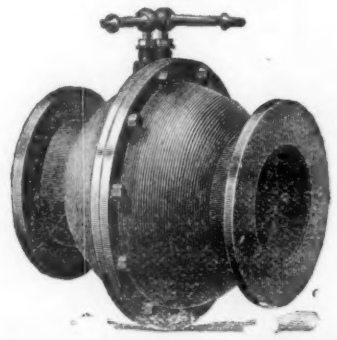

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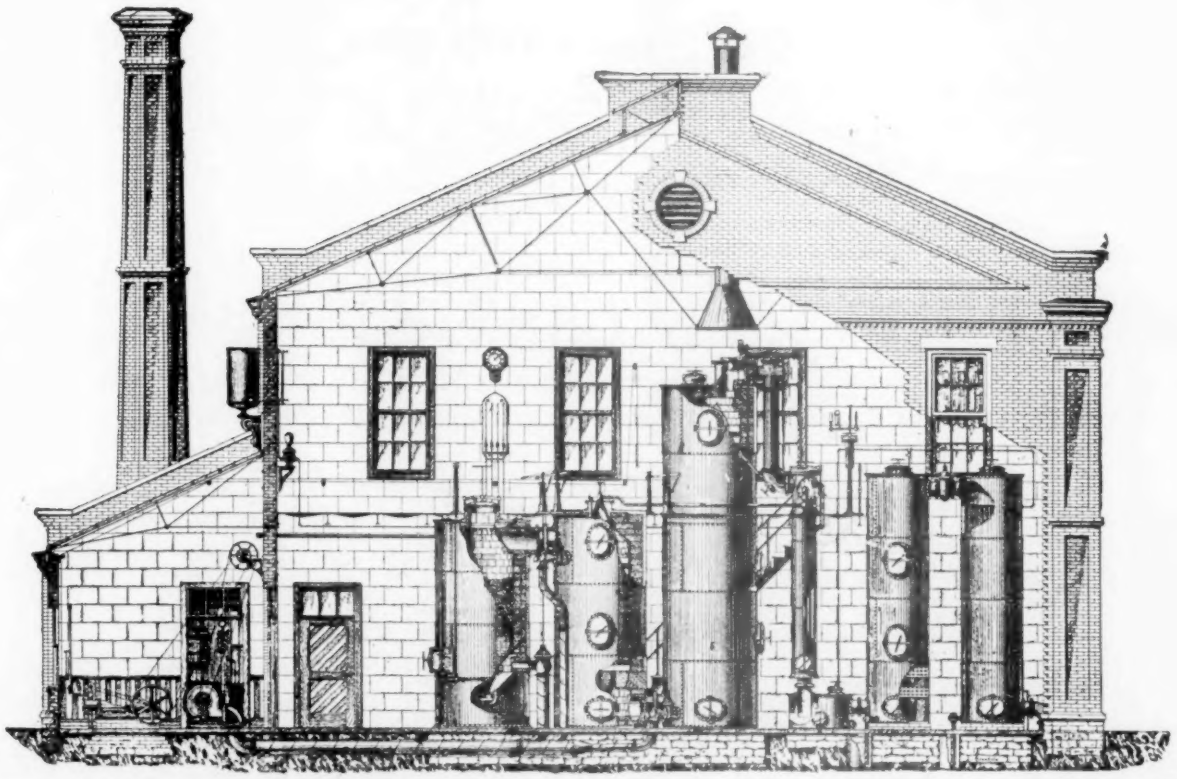

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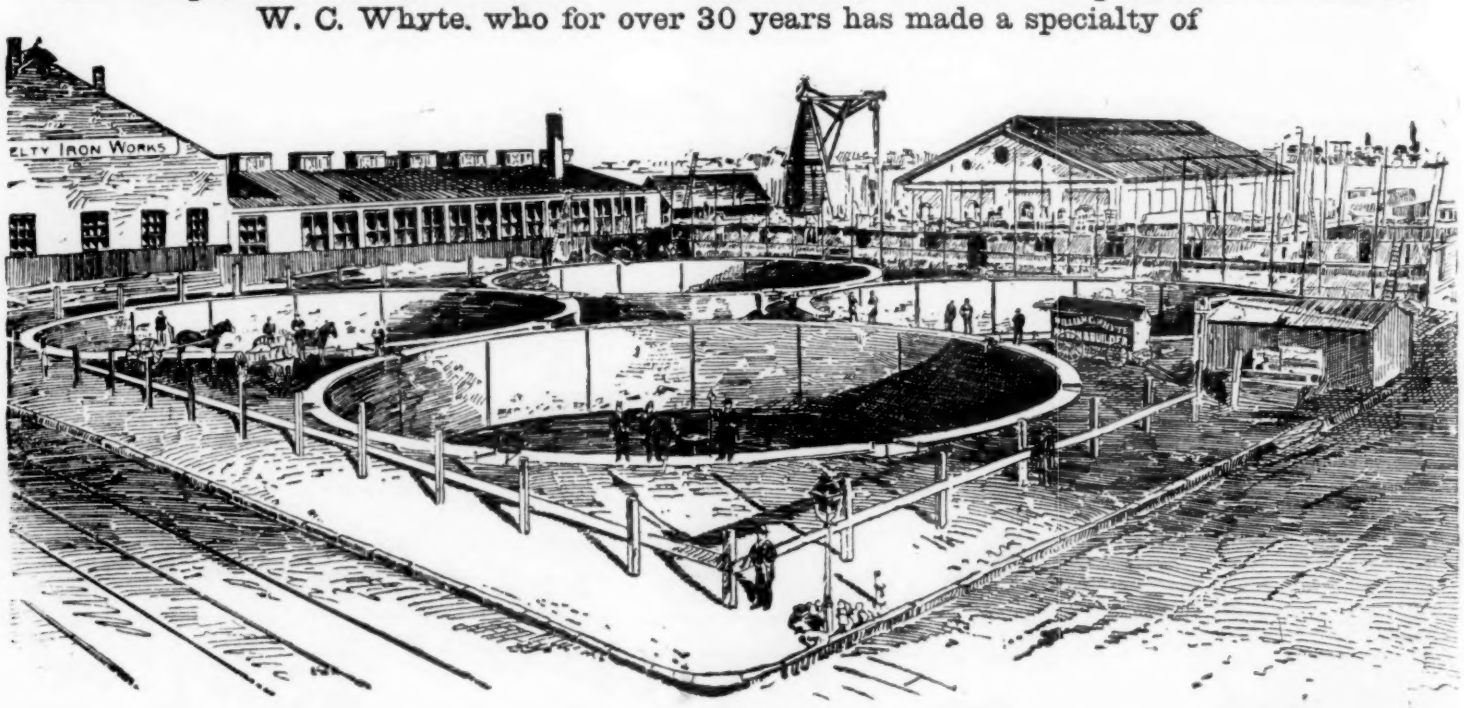

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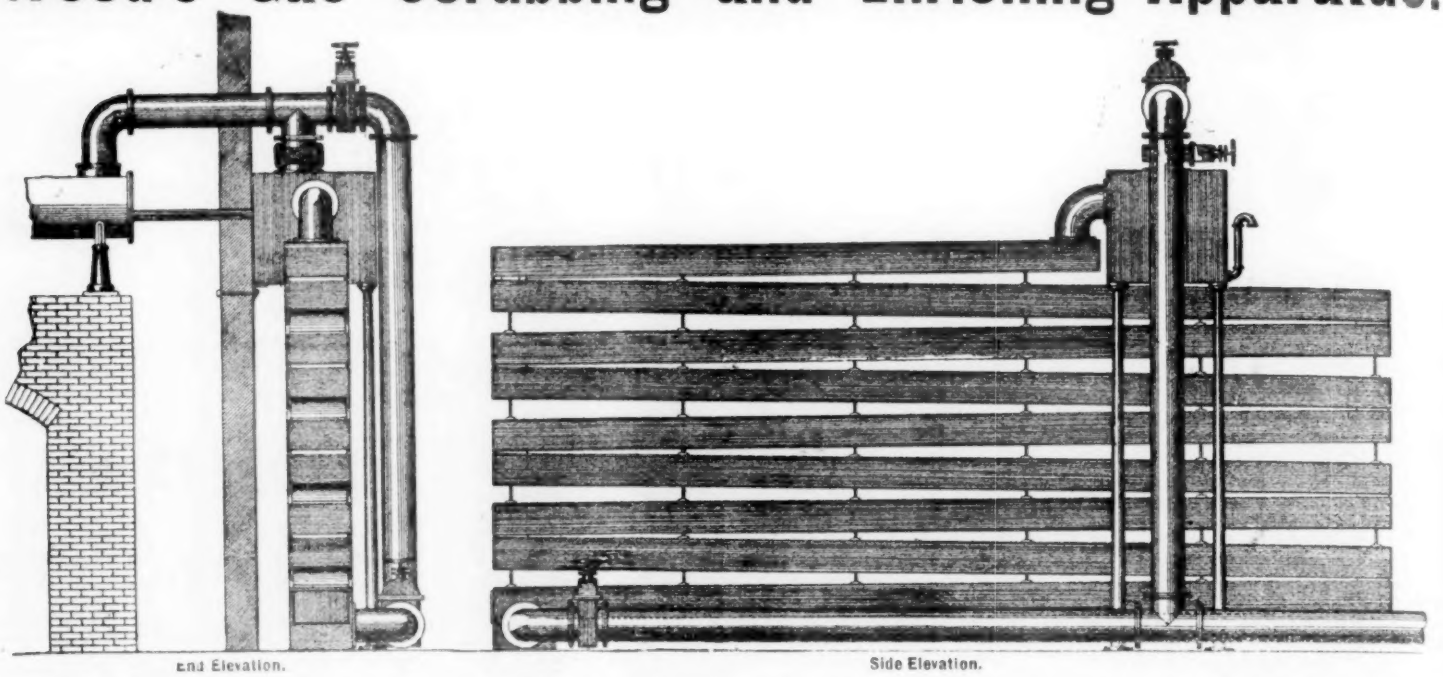

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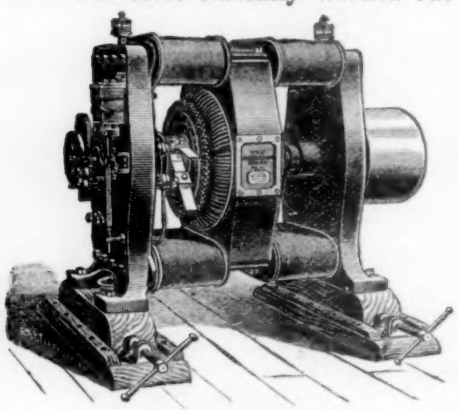

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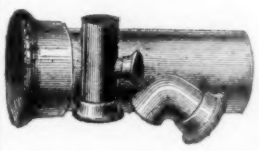

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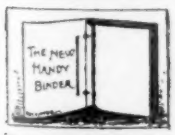

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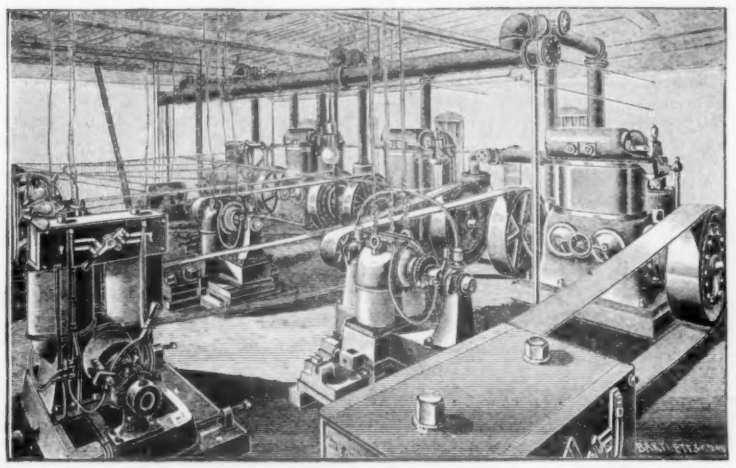

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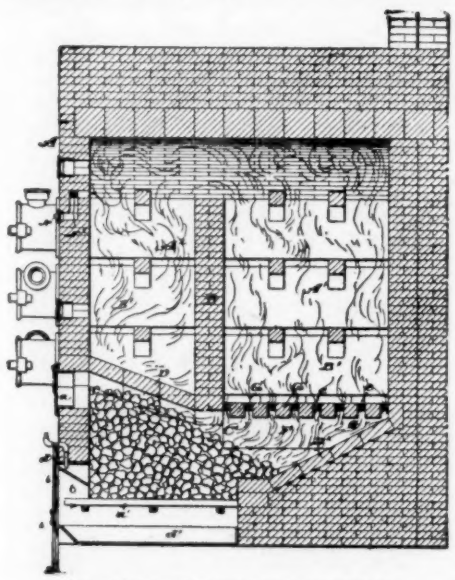

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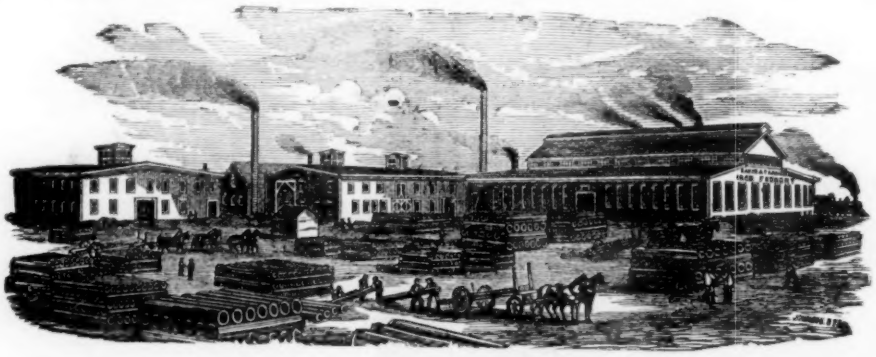

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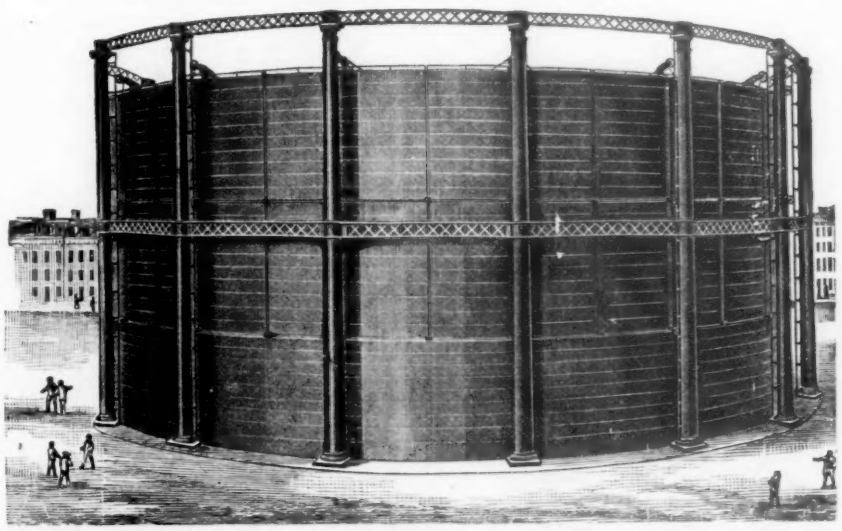

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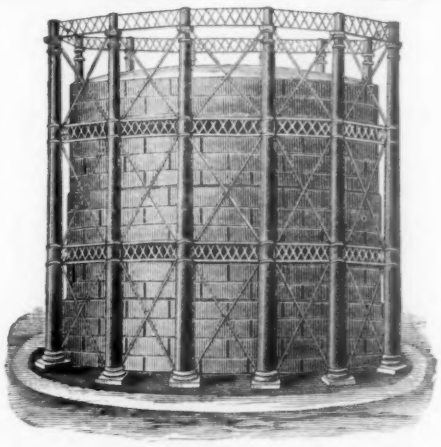

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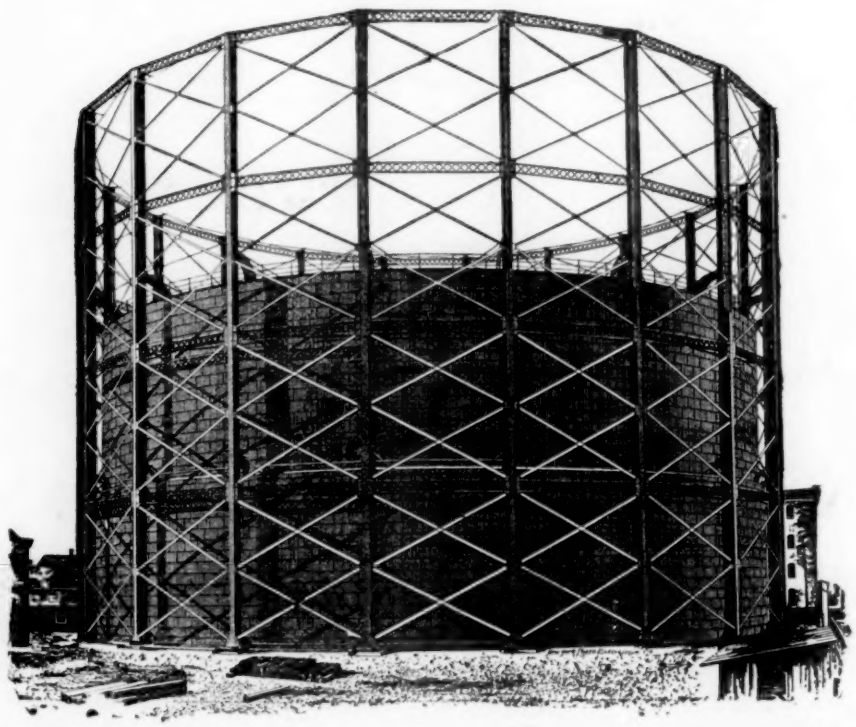

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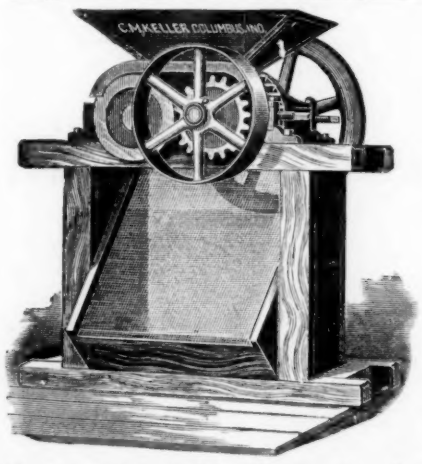

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